

HP ProLiant ML310 Server

Maintenance and Service Guide



April 2003 (Fifth Edition)
Part Number 274429-005

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About This Guide

This maintenance and service guide can be used for reference when servicing HP ProLiant ML310 servers.



WARNING: To reduce the risk of personal injury from electric shock and hazardous energy levels, only authorized service technicians should attempt to repair this equipment. Improper repairs can create conditions that are hazardous.

Audience Assumptions

This guide is for service technicians. HP assumes you are qualified in the servicing of computer equipment and trained in recognizing hazard in products with hazardous energy levels and are familiar with weight and stability precautions for rack installations.

Technician Notes



WARNING: Only authorized technicians trained by HP should attempt to repair this equipment. All troubleshooting and repair procedures are detailed to allow only subassembly/module-level repair. Because of the complexity of the individual boards and subassemblies, no one should attempt to make repairs at the component level or to make modifications to any printed wiring board. Improper repairs can create a safety hazard.



WARNING: To reduce the risk of personal injury from electric shock and hazardous energy levels, do not exceed the level of repairs specified in these procedures. Because of the complexity of the individual boards and subassemblies, do not attempt to make repairs at the component level or to make modifications to any printed wiring board. Improper repairs can create conditions that are hazardous.



WARNING: To reduce the risk of electric shock or damage to the equipment:

- Disconnect power from the system by unplugging all power cords from the power supplies.
- Do not disable the power cord grounding plug. The grounding plug is an important safety feature.
- Plug the power cord into a grounded (earthed) electrical outlet that is easily accessible at all times.



CAUTION: To properly ventilate the system, you must provide at least 7.6 cm (3.0 in) of clearance at the front and back of the server.



CAUTION: The computer is designed to be electrically grounded (earthed). To ensure proper operation, plug the AC power cord into a properly grounded AC outlet only.

NOTE: Any indications of component replacement or printed wiring board modifications may void any warranty.

Where to Go for Additional Help

In addition to this guide, the following information sources are available:

- User documentation
- *Service Quick Reference Guide*
- Service training guides
- HP service advisories and bulletins
- QuickFind information services
- Insight Manager software

For additional copies, go to

www.hp.com

Integrated Management Log

The server includes an integrated, nonvolatile management log that contains fault and management information. The contents of the Integrated Management Log (IML) can be viewed with Insight Manager.

Telephone Numbers

For the name of your nearest HP authorized reseller:

- In the United States, call 1-800-345-1518.
- In Canada, call 1-800-263-5868.

For HP technical support:

- In the United States and Canada, call 1-800-652-6672.
- Outside the United States and Canada, refer to

www.hp.com

Illustrated Parts Catalog

This chapter provides the illustrated parts breakdown and spare parts lists for the HP ProLiant ML310 server with an Intel® Pentium® 4 processor. Refer to Table 1-1 and Table 1-2 for the names of referenced spare parts.

Mechanical Parts Exploded View

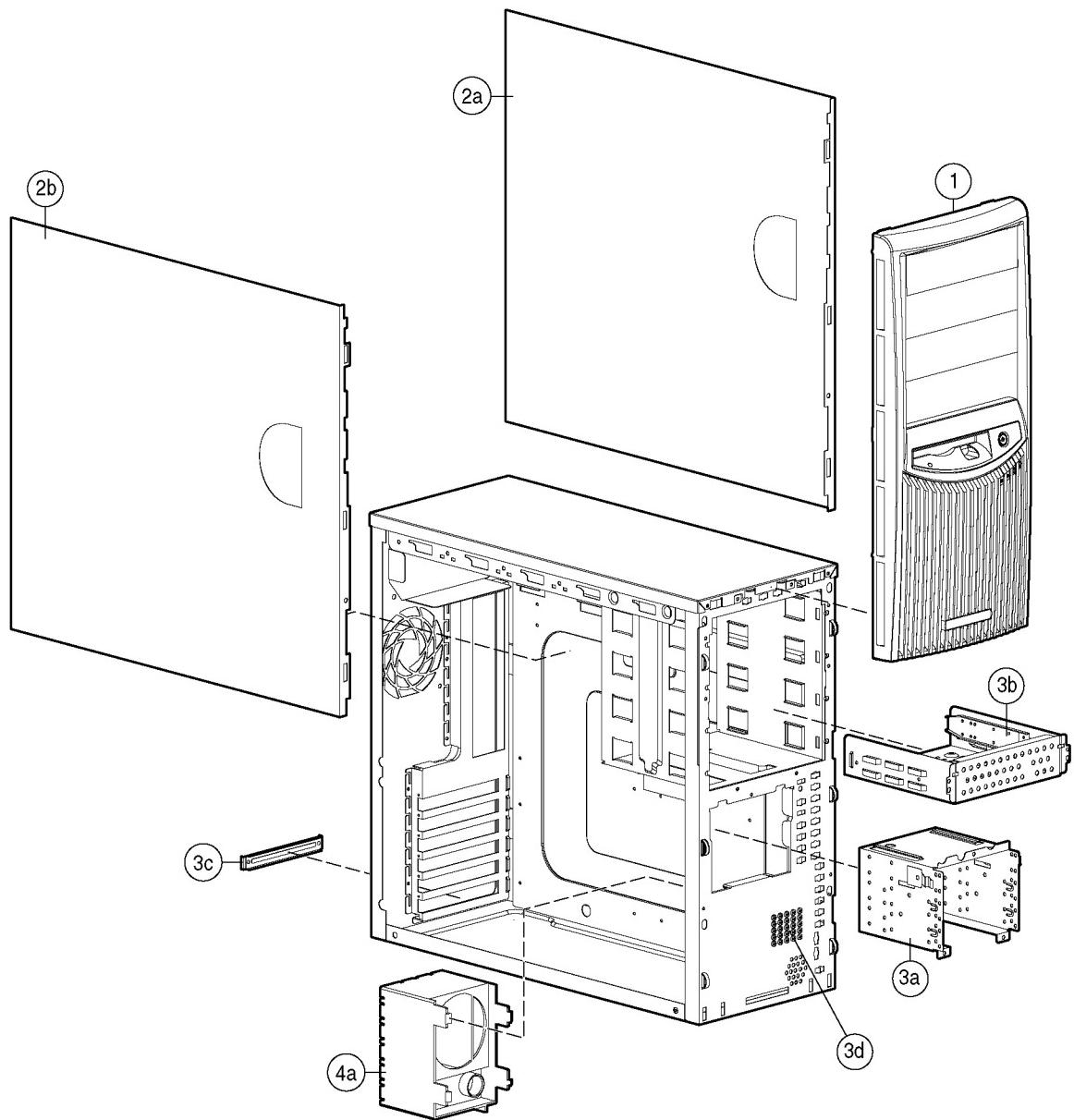


Figure 1-1: Mechanical parts exploded view

Mechanical Spare Parts List

Table 1-1: Mechanical Spare Parts List

Item	Description	Spare Part Number
Chassis		
1	Front bezel	287180-001
2	Panel access	307549-001
	a) Hood panel (right)	
	b) Access panel (left)	
Miscellaneous		
3	Hardware kit	176618-001
	a) Hard drive compartment	
	b) Removable drive tray	
	c) Expansion board knockout	
	d) Hard drive screws	
4	Miscellaneous plastics kit	176617-001
	a) Expansion board guide	
	b) Rubber bumpers*	
	c) Removable media bezel blank*	
	d) Cable clips*	
	e) Miscellaneous clamps*	
	f) LED shield*	

*Not shown

Server Components Exploded View (ATA Model)

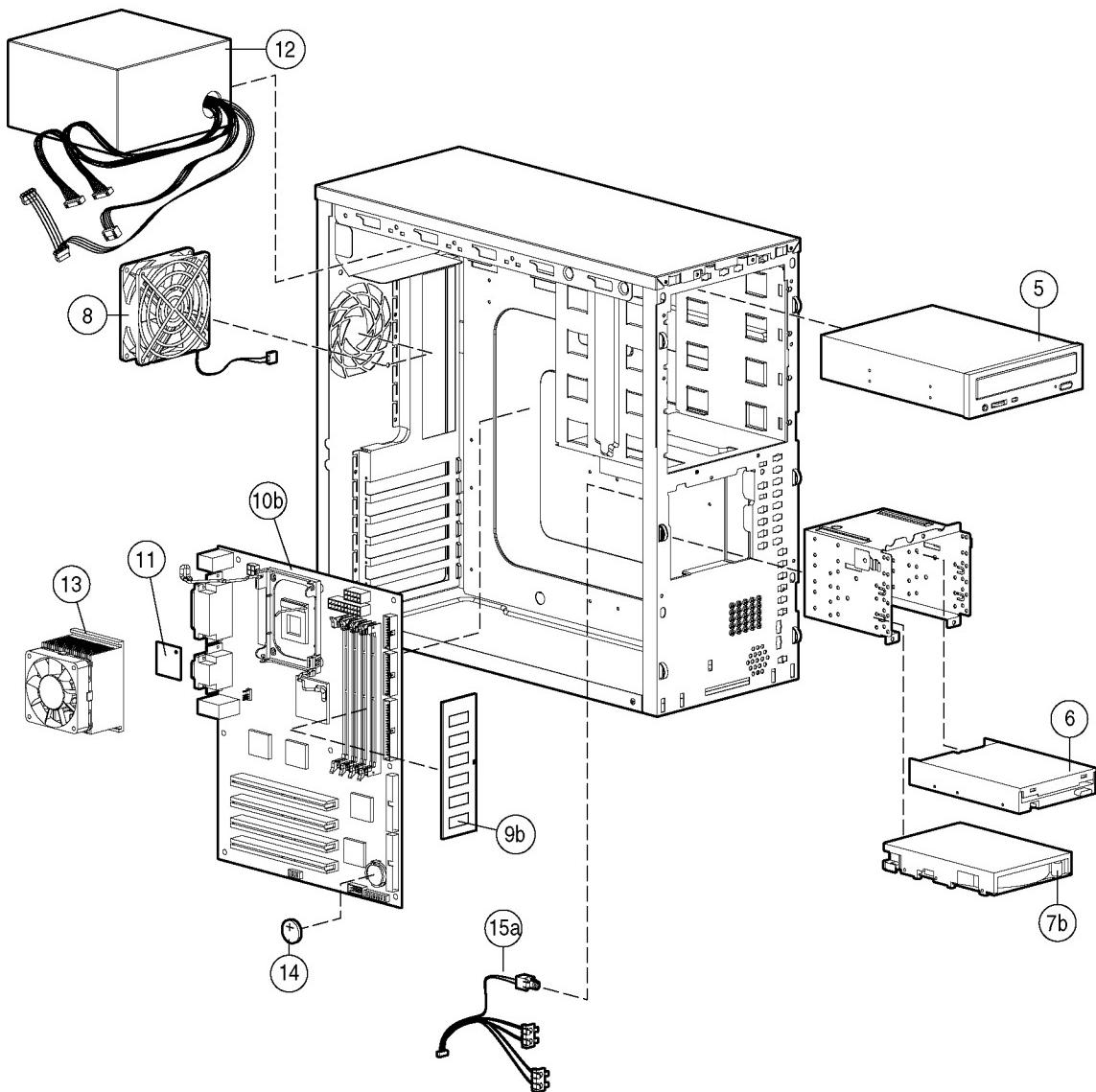


Figure 1-2: Server components exploded view (ATA model)

Server Components Exploded View (SCSI Model)

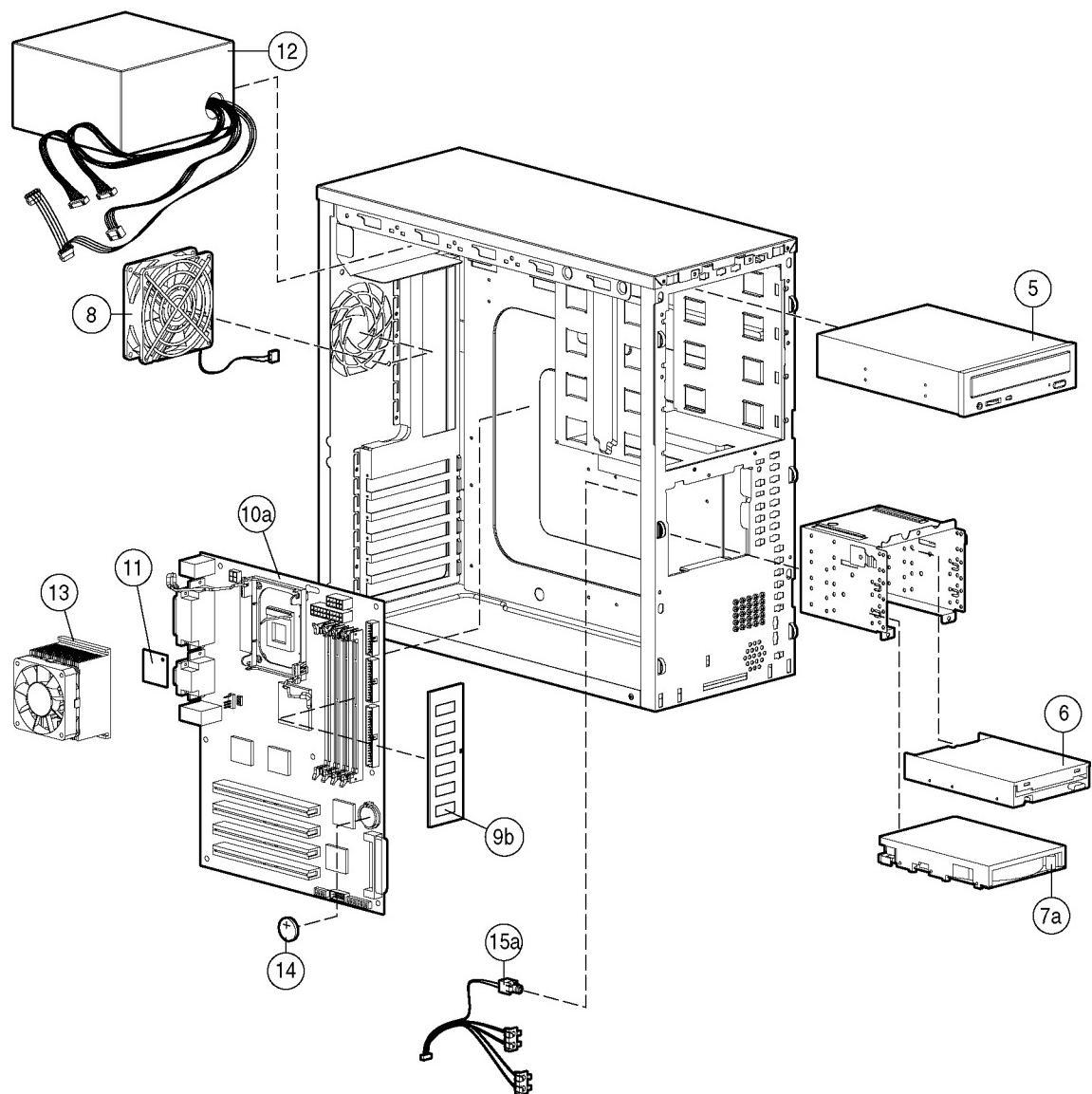


Figure 1-3: Server components exploded view (SCSI model)

Server Components Spare Parts List

Table 1-2: Server Components Spare Parts List

Item	Description	Spare Part Number
Mass Storage Devices		
5	IDE CD-ROM drive 48X	288894-001
6	Diskette drive	233409-001
7	Hard drive	
	a) 36-GB Wide Ultra3 hard drive, 10K RPM (SCSI model)	177986-001
	b) 40-GB ATA hard drive (ATA model)	232008-001
	c) 18-GB Wide Ultra3 hard drive, 10K RPM (SCSI model)*	152191-001
Server Components		
8	System fan	287179-001
9	ECC Registered DDR SDRAM DIMM	
	a) 128-MB*	301691-001
	b) 256-MB	300699-001
	c) 512-MB*	300700-001
	d) 1-GB*	300701-001
Boards		
10	System board	
	a) 533-MHz front side bus SCSI	313026-001
	b) 533-MHz front side bus ATA	313025-001
	c) 400-MHz front side bus SCSI*	287176-001
	d) 400-MHz front side bus ATA*	287175-001
<p>NOTE: Both 533-MHz and 400-MHz front side bus system boards are supported in systems with a processor speed of 2.2-GHz or less, but only 533-MHz front side bus system boards are supported in systems with a 2.53-GHz processor.</p>		
11	Pentium 4 processor	
	a) 2.0-GHz*	287177-001
	b) 2.2-GHz*	287178-001
	c) 2.53-GHz*	311403-001
	d) 2.8-GHz	311404-001
Power		
12	CE Mark-compliant power supply, 300 W	292480-001
13	Heatsink and CPU fan	294988-001

*Not shown

continued

Table 1-2: Server Components Spare Parts List *continued*

Item	Description	Spare Part Number
14	CR2032 lithium battery	234556-001
15	Power cable kit a) Power button assembly b) Power shield cable* c) Power extension cable*	287181-001
	Miscellaneous	
16	Enhanced keyboard* a) European keyboard—UK* b) European keyboard—GR* c) European keyboard—FR* d) Spacesaver keyboard—JP*	244000-001 244000-031 244000-041 244000-051 244000-291
17	Signal cable kit* a) ATA ribbon cable assembly* b) Diskette drive cable assembly* c) CD cable assembly*	253826-001
18	Ultra3 SCSI cable*	289229-001
19	Rack enabling kit*	302569-001
20	Country kit*	308250-001
21	Return kit*	176621-001

*Not shown

Removal and Replacement Procedures

This chapter provides subassembly/module-level removal and replacement procedures for the HP ProLiant ML310 server. Run the diagnostics program to be sure that all components are operating properly.

To service the server, you might need the following:

- Torx T-15 screwdriver
- Phillips screwdriver
- Diagnostics software from the SmartStart CD

Electrostatic Discharge Information

An electrostatic discharge (ESD) can damage static-sensitive devices or microcircuitry. Proper packaging and grounding techniques are necessary precautions to prevent damage. To prevent electrostatic damage, observe the following precautions:

- Transport products in static-safe containers such as conductive tubes, bags, or boxes.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free stations.
- Cover workstations with approved static-dissipating material. Use a wrist strap connected to the work surface, and properly grounded (earthed) tools and equipment.
- Keep work area free of nonconductive materials, such as ordinary plastic assembly aids and foam packing.
- Be sure that you are always properly grounded when touching a static-sensitive component or assembly.
- Avoid touching pins, leads, or circuitry.
- Always place drives with the Printed Circuit Board (PCB) assembly-side down.
- Use conductive field service tools.

Symbols on Equipment

These symbols may be located on equipment in areas where hazardous conditions may exist.



This symbol, in conjunction with any of the following symbols, indicates the presence of a potential hazard. The potential for injury exists if warnings are not observed.



This symbol indicates the presence of hazardous energy circuits or electric shock hazards. Refer all servicing to qualified personnel.

WARNING: To reduce the risk of injury from electric shock hazards, do not open this enclosure. Refer all maintenance, upgrades, and servicing to qualified personnel.



This symbol indicates the presence of electric shock hazards. The area contains no user- or field-serviceable parts. Do not open for any reason.

WARNING: To reduce the risk of injury from electric shock hazards, do not open this enclosure.



This symbol, on an RJ-45 receptacle, indicates a network interface connection.

WARNING: To reduce the risk of electric shock, fire, or damage to the equipment, do not plug telephone or telecommunications connectors into this receptacle.



This symbol indicates the presence of a hot surface or hot component. If this surface is contacted, the potential for injury exists.

WARNING: To reduce the risk of injury from a hot component, allow the surface to cool before touching it.



These symbols, on power supplies or systems, indicate that the equipment is supplied by multiple sources of power.

WARNING: To reduce the risk of injury from electric shock, remove all power cords to completely disconnect power from the system.



This symbol indicates that the component exceeds the recommended weight for one individual to safely handle.

Weight in kg
Weight in lb **WARNING:** To reduce the risk of personal injury or damage to the equipment, observe local occupational health and safety requirements and guidelines for manual material handling.

Preparation Procedures



WARNING: Only authorized technicians trained by HP should attempt to repair this equipment. Because of the complexity of the individual boards and subassemblies, no one should attempt to make repairs at the component level or to make modifications to any printed wiring board. Improper repairs can create a safety hazard.



CAUTION: Electrostatic discharge (ESD) can damage electronic components. Be sure that you are properly grounded (earthed) before beginning any installation procedure. Refer to "Electrostatic Discharge Information" in this chapter for more information.

Powering Down the Server

To power down the server:



CAUTION: Failure to follow these directions could result in damage to equipment or loss of information.

1. Back up the server data and record configuration information.
2. Shut down the operating system as directed in the operating system instructions.
3. If necessary, power down the server by pressing the power button on the front of the server.

IMPORTANT: To completely remove all power from the server, you must disconnect the power cord. The front panel power button may not completely shut down power to the server.

4. Disconnect and remove the AC power cord from the AC outlet, and then from the server.



WARNING: To reduce the risk of injury from electric shock or damage to the equipment when installing hardware, be sure that the power to the server is turned off. Remove any AC power cords to completely disconnect power from the server. The front panel power button may not completely remove power to the server.

5. Disconnect any other external equipment connections to the server.

Server Warnings and Precautions



WARNING: To reduce the risk of injury from electric shock, disconnect all power cords to completely remove power from the server.



WARNING: To reduce the risk of personal injury from hot surfaces, allow the internal server components to cool before touching them.



CAUTION: Protect the server from power fluctuations and temporary interruptions with a regulating uninterruptible power supply (UPS). This device protects the hardware from damage caused by power surges and voltage spikes, and keeps the server in operation during a power failure.



CAUTION: The server must always be operated with server unit covers on. Proper cooling is not achieved when the server unit covers are removed.

Front Bezel



WARNING: To reduce the risk of personal injury and to prevent damage to the equipment, before removing the front bezel, be sure that the server is powered down, all cables are disconnected from the back of the server, and the power cord is disconnected from the grounded (earthed) AC outlet.

To remove the front bezel:

1. Complete the preparation procedures. Refer to “Preparation Procedures” in this chapter.
2. Pull up on the latch at the bottom of the front bezel, applying enough pressure to release the latch from the chassis (1).
3. Swing the bezel upward, and then slide it out and away from the chassis (2). You may need to exert a small amount of force to release the bezel from the chassis.

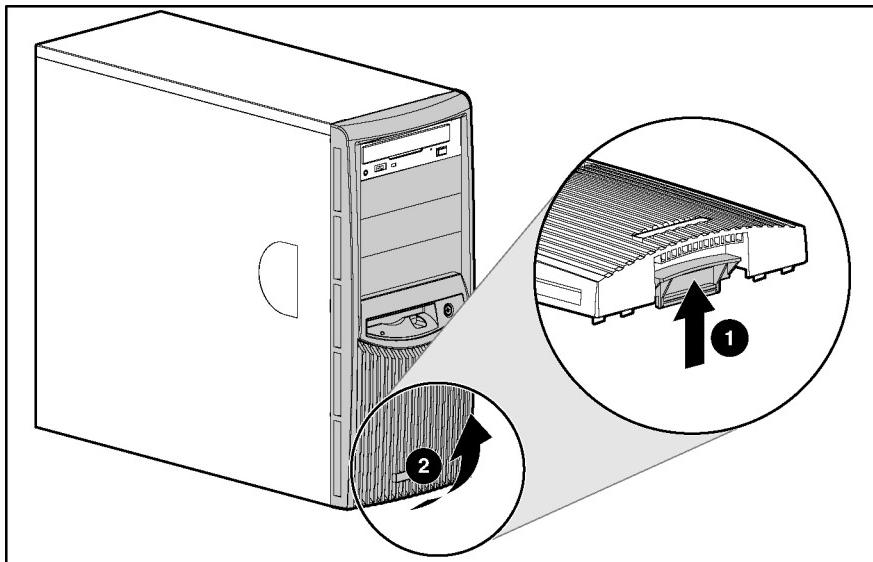


Figure 2-1: Removing the front bezel

NOTE: When replacing the front bezel, be sure that the top hinge points are properly placed in the chassis before rotating the front bezel back into its original position.

To replace the front bezel, reverse steps 2 and 3.

Access Panel



WARNING: To reduce the risk of personal injury from hot surfaces, allow the internal server components to cool before touching them.



WARNING: To reduce the risk of personal injury and to prevent damage to the equipment or loss of information, before removing the access panel, be sure that the server is powered down, all cables are disconnected from the back of the server, and the power cord is disconnected from the grounded (earthed) AC outlet.



CAUTION: Do not operate the server while the access panel is removed. This panel is an integral part of the cooling system, and removing the panel while the server is running may adversely affect data integrity.

To remove the access panel:

1. Perform the preparation procedures. Refer to “Preparation Procedures” in this chapter.
2. Remove the front bezel. Refer to “Front Bezel” in this chapter.
3. Remove the thumbscrew located on the left side of the front chassis (1).
4. Slide the access panel forward, pull from the top of the access panel, and then lift the panel from the chassis (2).

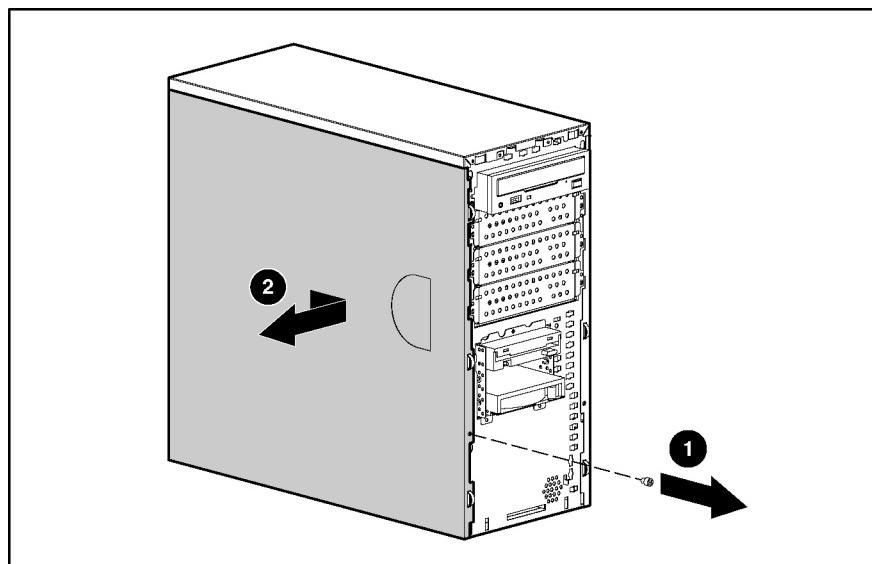


Figure 2-2: Removing the access panel

NOTE: Turn the access panel over to locate the server configuration label. This label provides information about the system board of the server.

To replace the access panel, reverse steps 3 and 4.

Storage Devices

The ProLiant ML310 server ships standard with seven drive bays, five of which are available. Table 2-1 shows the corresponding drive bay descriptions.

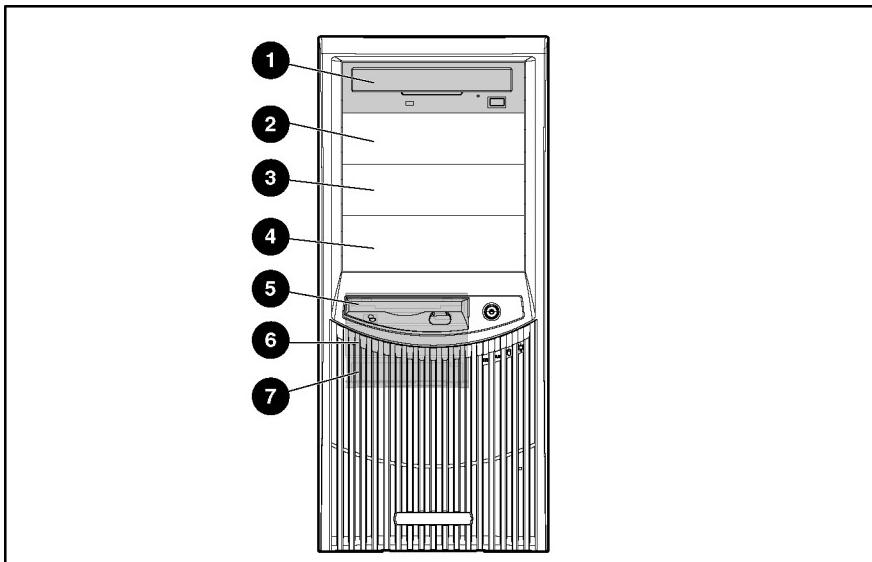


Figure 2-3: Storage device drive bay locations

Table 2-1: Storage Device Drive Bay Description

Drive Position	Description
1	5.25 x 1.6 inch IDE CD-ROM drive bay
2	5.25 x 1.6 inch removable media drive bay, available
3	5.25 x 1.6 inch removable media drive bay, available
4	5.25 x 1.6 inch removable media drive bay, available
5	3.5 x 1 inch diskette drive bay
6	3.5 x 1 inch hard drive bay
7	3.5 x 1 inch hard drive bay

Bezel Blanks

To remove a bezel blank from the front bezel:



WARNING: To reduce the risk of personal injury and to prevent damage to the equipment, before removing the front bezel, be sure that the server is powered down, all cables are disconnected from the back of the server, and the power cord is disconnected from the grounded AC outlet.

NOTE: It is not necessary to remove a bezel blank when installing a hard drive into a removable media bay.

1. Remove the front bezel. Refer to “Front Bezel” in this chapter.
2. On the back of the front bezel, pinch the tabs on each end of the bezel blank toward each other (1), and then push the bezel blank through the front bezel (2).

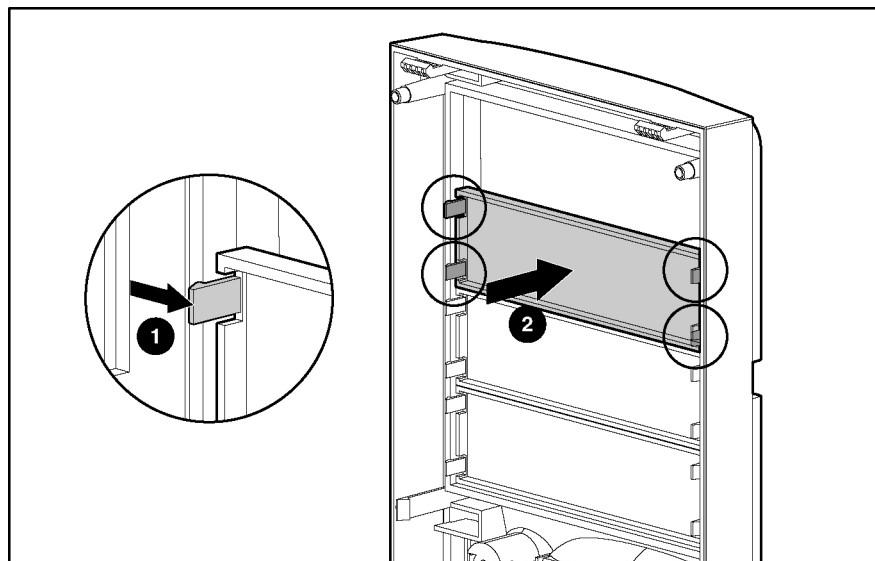


Figure 2-4: Removing a bezel blank

To replace a bezel blank, reverse steps 1 and 2.

System Fan

To remove the system fan:

1. Complete the preparation procedures. Refer to “Preparation Procedures” in this chapter.
2. Remove the access panel. Refer to “Access Panel” in this chapter.
3. Disconnect the fan power cable from the system board fan connector.

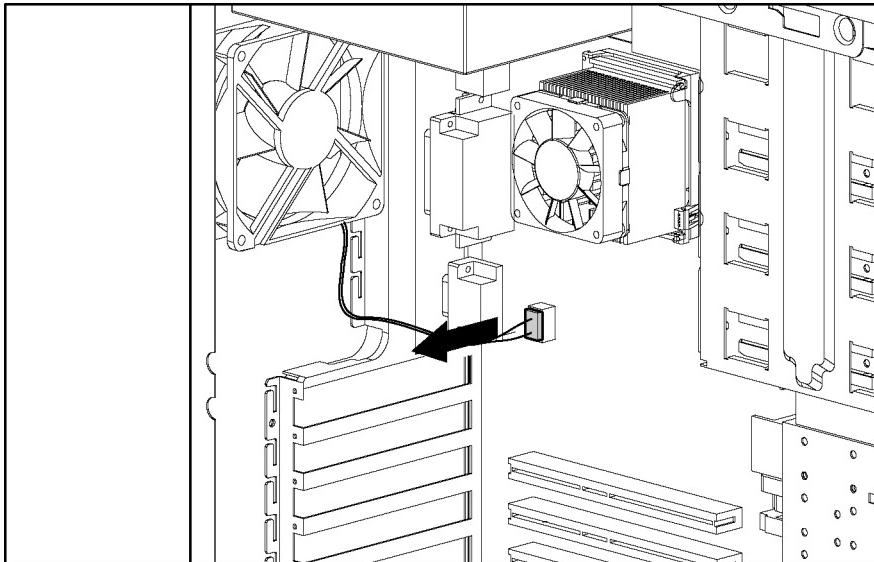


Figure 2-5: Disconnecting the fan power cable from the system board fan connector

4. Use a Torx T-15 screwdriver to remove the four mounting screws from the rear of the server (1).
5. Pull the fan out and away from the chassis (2).

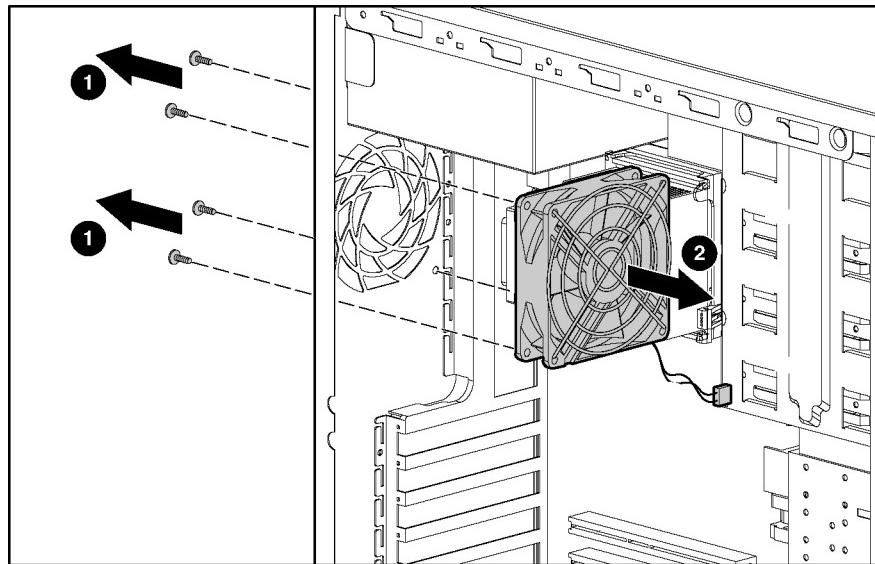


Figure 2-6: Removing the system fan

To replace the system fan, reverse steps 2 through 5.

Cable Routing Diagrams

Figure 2-7 through Figure 2-9 show cable routing diagrams for the server.

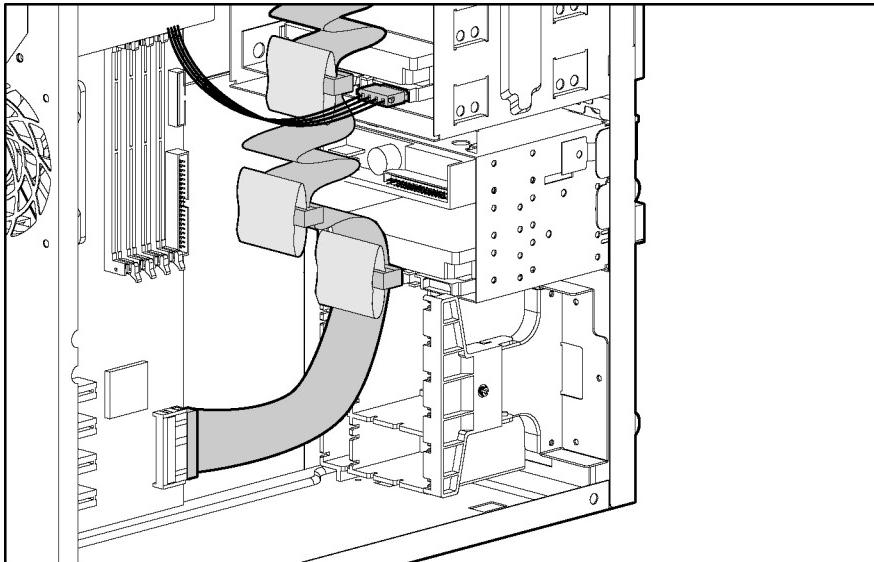


Figure 2-7: SCSI cable routing

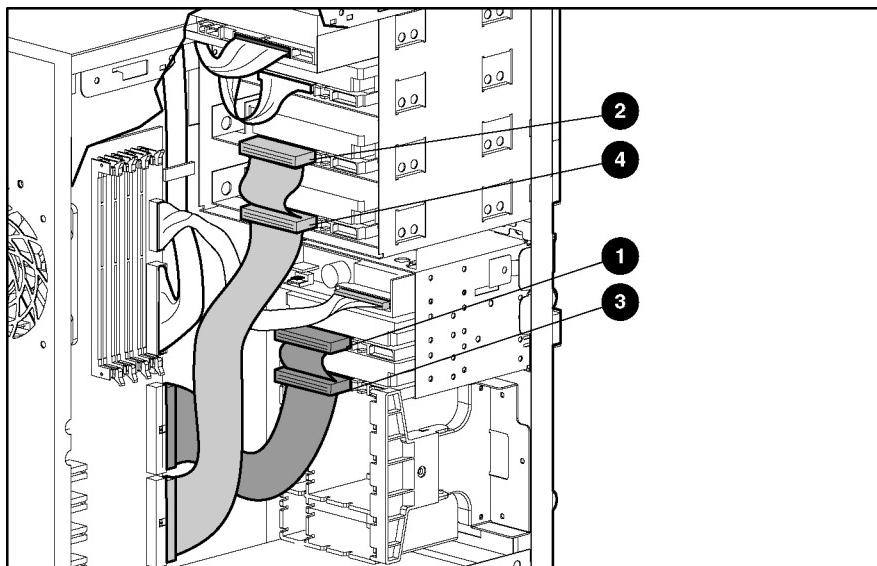


Figure 2-8: ATA cable routing

Table 2-2: ATA Cabling Routing

Item	Channel/Cable	Cable Connector	Drive Location
1	ATA/100 RAID primary controller	Device 0	Hard drive bay 2
2	ATA/100 RAID secondary controller	Device 0	Media bay 3
3	ATA/100 RAID primary controller	Device 1	Hard drive bay 3
4	ATA/100 RAID secondary controller	Device 1	Media bay 4

ATAPI Tape Drive Cable Routing

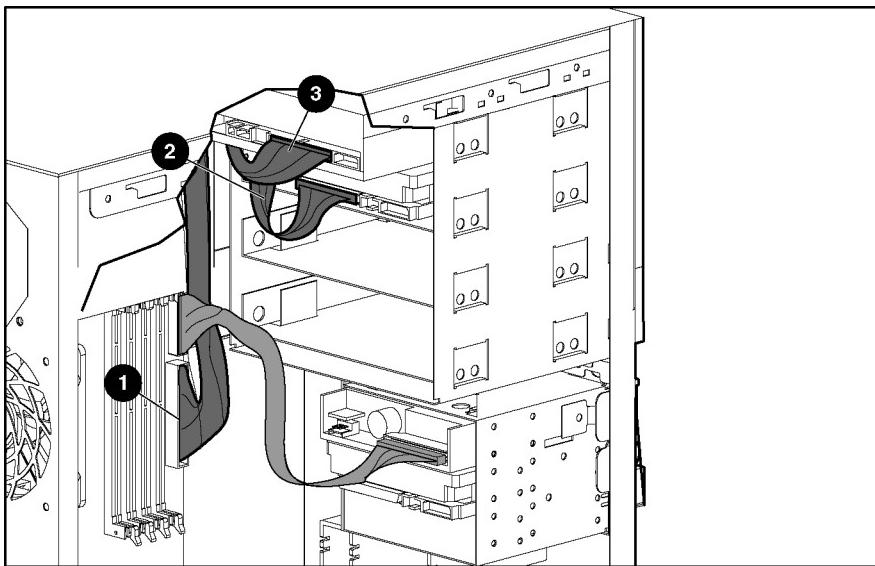


Figure 2-9: ATAPI tape drive cable routing

Table 2-3: ATAPI Tape Drive Cable Routing

Item	Connector
1	Integrated IDE channel
2	Device 1
3	Device 0

Drive Tray

To remove a drive tray from a removable media bay:



WARNING: To reduce the risk of personal injury and to prevent damage to the equipment, before removing the access panel, be sure that the server is powered down, all cables are disconnected from the back of the server, and the power cord is disconnected from the grounded (earthed) AC outlet.

NOTE: The drive trays in the removable media bays can be used to mount internal 3.5-inch hard drives. The rails mounted inside the drive trays can be removed and used to mount other devices in the removable media bays.

1. Complete the preparation procedures. Refer to “Preparation Procedures” in this chapter.
2. Remove the access panel. Refer to “Access Panel” in this chapter.
3. Using a Torx T-15 screwdriver, remove the screws on each side of the drive tray (1), and then gently slide the drive tray out of the front of the chassis (2).

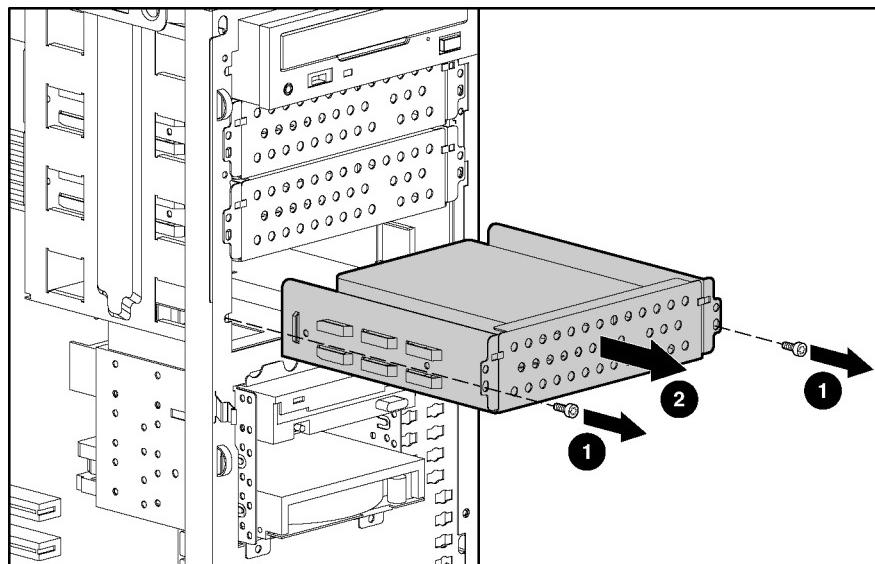


Figure 2-10: Removing a drive tray

To replace a drive tray, reverse steps 2 and 3.

Removing a Hard Drive Compartment

To remove a hard drive compartment:

1. Complete the preparation procedures. Refer to “Preparation Procedures” in this chapter.
2. Remove the access panel. Refer to “Access Panel” in this chapter.
3. Disconnect the power and data cables from the back of all devices in the hard drive compartment being removed.

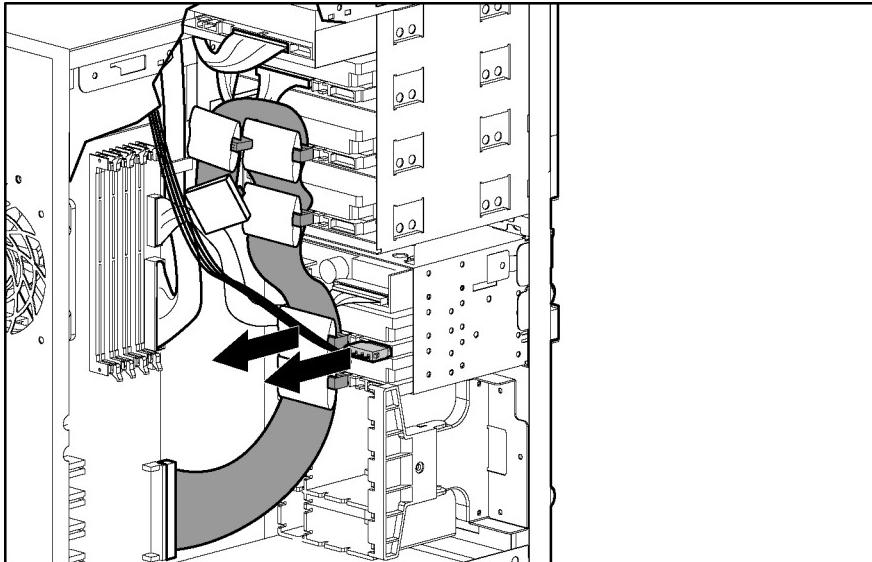


Figure 2-11: Disconnecting power and data cables from the ATA hard drive compartment

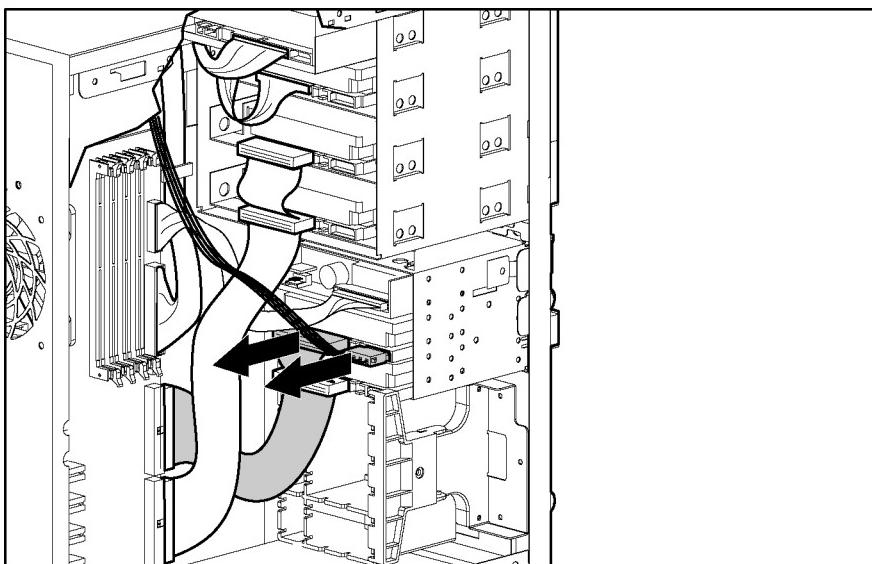


Figure 2-12: Disconnecting power and data cables from the SCSI hard drive compartment

4. Remove the three shipping screws (1), press the tabs on each side of the drive compartment (2), and then pull the drive compartment from the chassis (3).

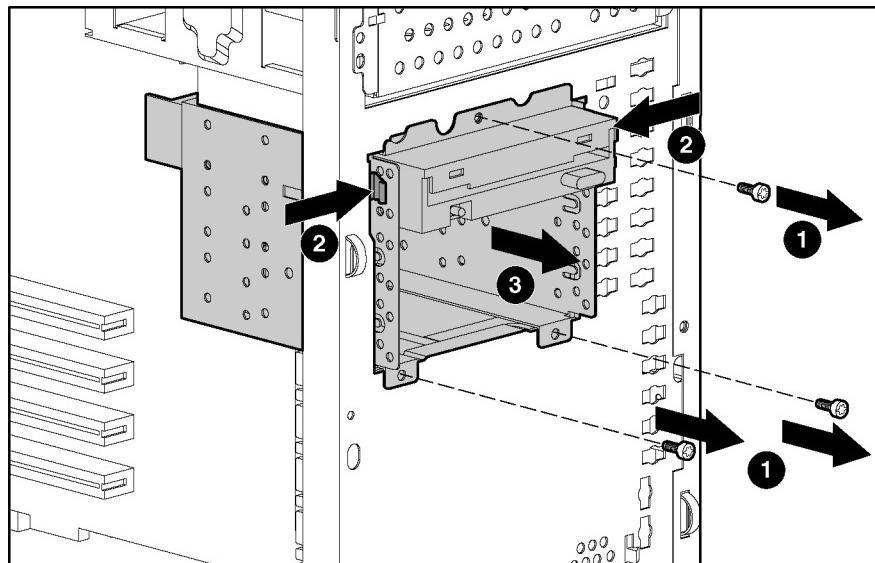


Figure 2-13: Removing a hard drive compartment

To replace a hard drive compartment, reverse steps 2 through 4.

Hard Drives

To remove a hard drive from the hard drive compartment:

1. Complete the preparation procedures. Refer to “Preparation Procedures” in this chapter.
2. Remove the access panel. Refer to “Access Panel” in this chapter.
3. Disconnect the power and data cables from the back of all devices in the hard drive compartment.
4. Remove the hard drive compartment. Refer to “Removing a Hard Drive Compartment” in this chapter.
5. Using a Phillips screwdriver, remove the two screws on each side of the drive to be removed (1), and then gently pull the drive out of the drive bay (2).

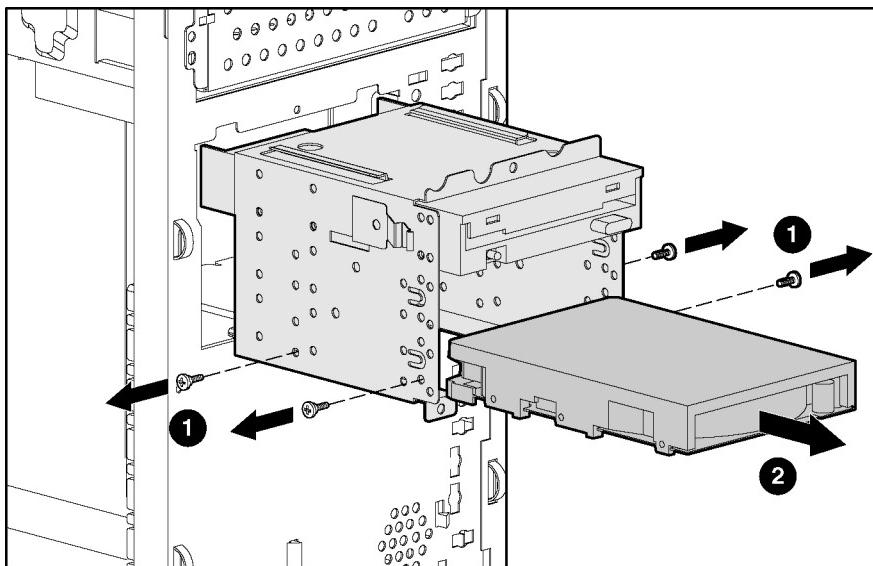


Figure 2-14: Removing a hard drive

To replace the hard drive:

1. Loosen the four diskette drive screws. They do not need to be removed.

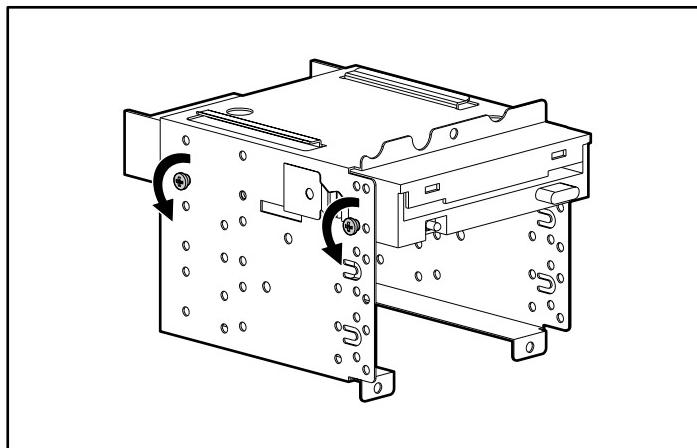


Figure 2-15: Loosening the diskette drive screws

2. Slide the drive into the drive bay (1), and then secure it with two screws on each side of the drive compartment (2).
3. Tighten the diskette drive screws (3).

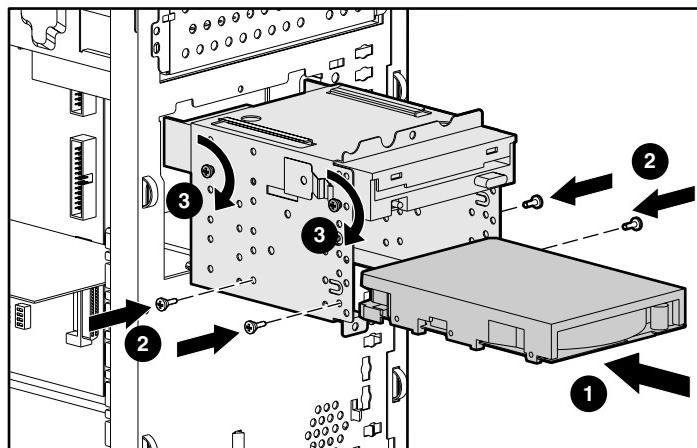


Figure 2-16: Replacing the hard drive

4. Slide the drive compartment back into the chassis, and then replace the three shipping screws.
5. Reconnect the diskette drive and hard drive cables, and then replace the access panel.

Drive Failure Scenarios

IMPORTANT: This section applies only to ATA models of the ProLiant ML310 server.

When a drive fails:

- Insight Manager notifies you of the drive failure.
- If applicable to the operating system, the RAID status icon changes from green to red to indicate that there is a problem. The icon is represented as a round figure wearing sunglasses and is located in the tray bar at the lower right of the screen.
- Some operating systems will also write to the console and/or a log file.

IMPORTANT: Some operating systems do not display the RAID status icon or the icon may be displayed differently.

The following sections provide instructions for rebuilding an array when a drive fails.

RAID 0 Configurations

A drive failure in a RAID 0 configuration causes data loss across the entire array. To recover from a drive failure, the array must be rebuilt from scratch. To rebuild the array:

1. Determine the failed drive by viewing the information provided at Power-On Self Test (POST) and in the Integrated ATA RAID Configuration Utility by pressing the **F8** key.
2. Power down the server, and then replace the failed drive.
3. Reboot the server and configure the array using the menu options in the Integrated ATA RAID Configuration Utility by pressing the **F8** key.

Refer to “Integrated ATA RAID Configuration Utility” in this chapter for information on the utility menu options.

RAID 1 Configurations

NOTE: This configuration is the only one where a spare pool configuration will have any value. A spare will provide a means by which a failed drive in a RAID 1 configuration may be rebuilt online.

In a RAID 1 configuration, there are two possible scenarios if a hard drive fails:

- If an online spare is configured:
 - The auto-rebuild process occurs without user intervention, removing the failed drive from the array and adding the spare to the array.
 - Reconfigure the online spare by doing the following:
 - a. Power down the server, and then replace the failed drive.
 - b. Run the Integrated ATA RAID Configuration Utility by pressing the **F8** key, and then configure the drive as a spare.

- If there is not an online spare configured:
 1. Power down the server, and then replace the failed drive.
 2. Reboot the server.
 3. Rebuild the array, choosing one of the following options:
 - a. Run the Integrated ATA RAID Configuration Utility by pressing the **F8** key, and then run **Rebuild**.
or
 - b. Let the auto-rebuild take place when the operating system is up and running.

Refer to “Integrated ATA RAID Configuration Utility” in this chapter for information on the utility menu options.

RAID 1+0 Configurations

NOTE: RAID 1+0, RAID 0+1, and RAID 10 are used synonymously.

Four ATA hard drives are required to support a RAID 1+0 configuration.

In a RAID 1+0 situation, multiple drive failures can be handled as long as both elements of a mirror have not failed.

To rebuild the array:

1. Power down the server, and then replace the failed drive.
2. Reboot the server.
3. Rebuild the array, choosing one of the following options:
 - a. Run the Integrated ATA RAID Configuration Utility by pressing the **F8** key, and then run **Rebuild**.
or
 - b. Let the auto-rebuild take place when the operating system is up and running.

Refer to “Integrated ATA RAID Configuration Utility” in this chapter for information on the utility menu options.

Integrated ATA RAID Configuration Utility

The setup screen of the Integrated ATA RAID Configuration Utility has three menu windows:

- Array Information
- Physical Drive Information
- Help Information

Array Information

IMPORTANT: You cannot add drives or remove drives from an array that has already been configured, without destroying the data present on the already configured array.

The **Array Information** window of the setup screen displays all the drive arrays configured. Use this section to create, delete, or edit the existing configurations. The drive arrays are displayed as a node in a tree, like Microsoft® Windows® Explorer. When opened, each node displays the properties of the array. Press the up arrow and down arrow keys to navigate the properties, and then press the **Enter** key to edit your selection.

Physical Drive Information

The **Physical Drive Information** window displays all the physical drives connected to the ATA/100 controller channels and their properties. Press the up arrow and down arrow keys to navigate this section. This window cannot be edited.

Help

The **Help** window displays hints on available options and provides a list of keys that you can use to perform tasks, such as:

- **Switch Windows** (the **Tab** key)—switches the control back and forth between the **Array Information** and the **Physical Drive Information** windows.
- **Auto Configure RAID 0** (the **F1** key)—automatically creates and configures a striped array based on the available physical drives installed.
- **Auto Configure RAID 1** (the **F2** key)—automatically creates and configures a mirrored array based on the available physical drives installed. You must have a minimum of two free hard drives in the array.
- **Auto Configure RAID 0+1** (the **F3** key)—automatically creates and configures a RAID 0+1 array based on the available physical drives installed. You must have four hard drives in the array.

IMPORTANT: All previous settings are lost when the **Auto Configure** option is run for striped, mirrored, and RAID 0+1 arrays.

- **Create Array** (the **F4** key)—creates a drive array. When this option is selected, a default array template is created. You must edit the array properties to complete the array creation. Use the arrow keys to highlight a property field, and then press the **Enter** key to edit that property. The array properties are as follows:
 - **Array Type**—selects the intended RAID mode including RAID 0, RAID 1, RAID 0+1, and Spare. The default for the **Array Type** option is RAID 0.
 - **Drive(s)**—selects the drives for the array. This term refers to the drive number listed in the **Physical Drives Information** box, not the number of drives attached. Use the arrow keys, and then press the spacebar to select or deselect the drive or drives. Press the **Enter** key when done. There is no default for this setting.

- **Stripe Size**—changes the stripe size. This field applies only to RAID 0 arrays. The default stripe size is 64 KB.

IMPORTANT: RAID configurations do not support a stripe size less than 32 KB.

You cannot change the stripe size of an array that has been already configured.

- **Drive Size**—displays the size of the array and cannot be edited. If the array type is stripe, then the drive size is the total of all the drives selected. When mirrored, the drive size is shown by an individual drive.
- **Build Array**—is used to rebuild the array using a spare drive. When **Build Array** starts, it prompts the user to select the target drive, and then the rebuild starts. This option applies only to RAID 1 and RAID 0+1 arrays.
- **Initialize Array**—is used to clear the configuration information from drives attached to the integrated ATA controller.
- **Delete Array** (the **F5** key)—allows you to delete a currently configured array.
- **Restore Old Configuration** (the **F6** key)—restores the configuration that was there before you entered the utility.
- **Edit Options** (the **F7** key)—edits the physical drive option status boxes located in the top right corner of the **Physical Drive Information** window. The options are as follows:
 - **WC-OFF**—enables or disables write cache.



CAUTION: Enabling write cache may cause data loss or corruption during an unexpected loss of power.

-
- **DMA-ON**—enables or disables Direct Memory Access (DMA) transfers, in which data is transferred directly from the memory to the hard drive without microprocessor intervention.

Pressing the **F7** key will allow you to enable or disable these options. Press the **F7** key, move the cursor to the desired box, and then press the spacebar to select the option. When enabled, the option status boxes will change from red to green.

- **Save and Exit** (the **F10** key)—saves the configuration and exits the utility.

If you do not want to save the configuration or any changes that you have made, press the **Esc** key. Respond appropriately to the subsequent message boxes requiring confirmation.

Power Switch and LED

IMPORTANT: To completely remove all power from the server, you must disconnect the power cord from the server.

To remove the power switch:

1. Complete the preparation procedures. Refer to “Preparation Procedures” in this chapter.
2. Remove the access panel. Refer to “Access Panel” in this chapter.
3. Disconnect the power switch cable from the system board.

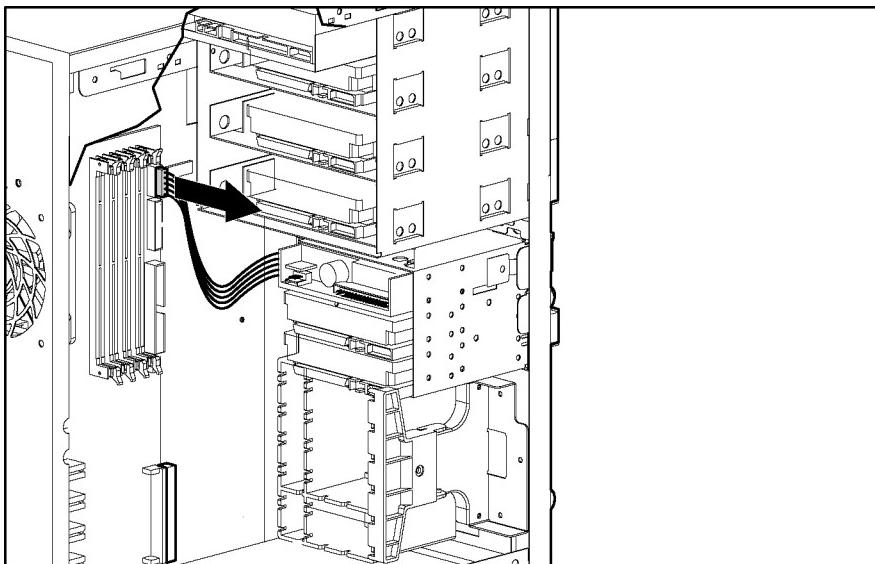


Figure 2-17: Disconnecting the power switch cable from the system board

4. Remove the LED shield from the front of the chassis by pressing the levers (1), and then pulling the shield away from the chassis (2).

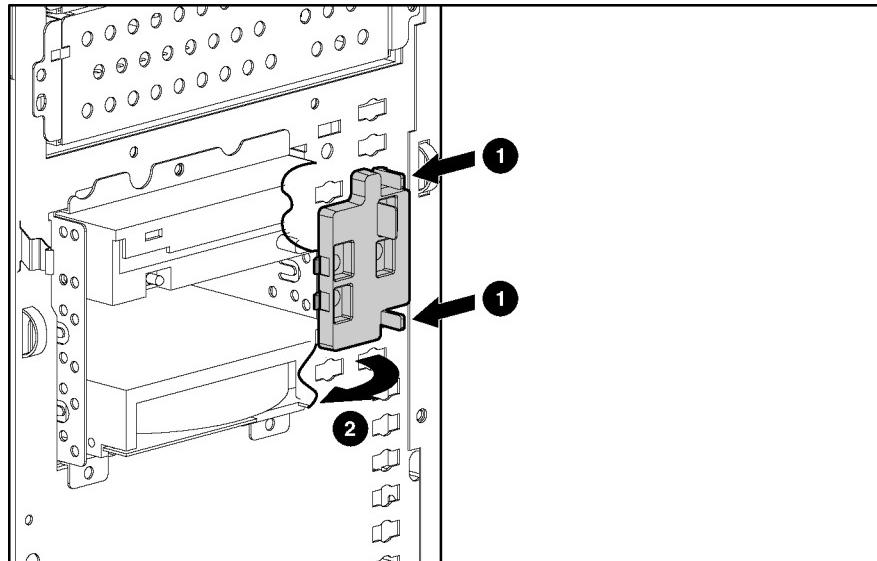


Figure 2-18: Removing the LED shield

5. From the front of the chassis, squeeze the sides of the power switch to disengage the two retainer clips from the chassis (1), and then gently remove the power switch from the chassis (2).
6. Also from the front of the chassis, squeeze the side of the LED to disengage the two retainer clips from the chassis (3), and then gently remove the LED from the chassis (4). Repeat for other LEDs.

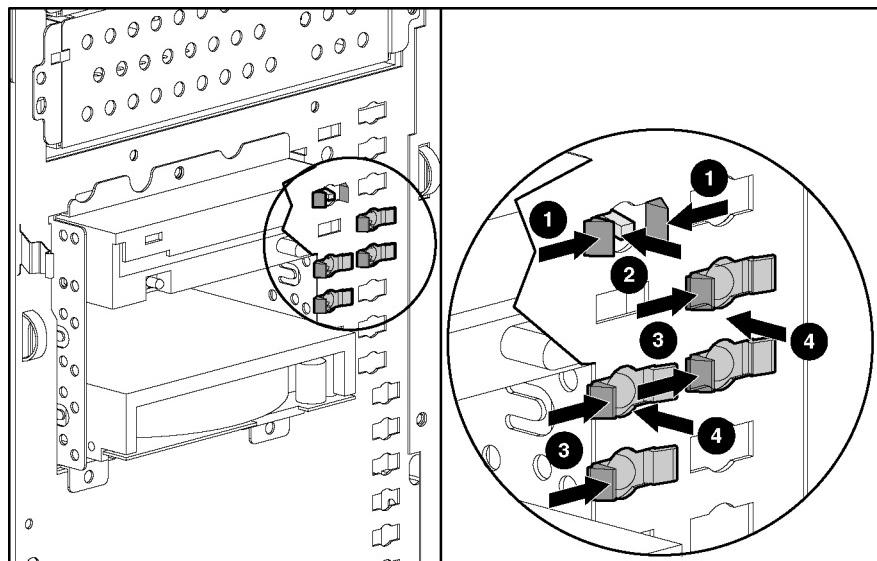


Figure 2-19: Removing the power switch and LED

To replace the power switch and LED, reverse steps 2 through 6.

Removing a Device from a Removable Media Bay

To remove a device from a removable media bay:

1. Complete the preparation procedures. Refer to “Preparation Procedures” in this chapter.
2. Remove the access panel. Refer to “Access Panel” in this chapter.
3. Disconnect the power and data cables from the back of the device.
4. Remove the screws from the front of the removable tray (1).
5. Remove the removable media tray from the chassis (2).

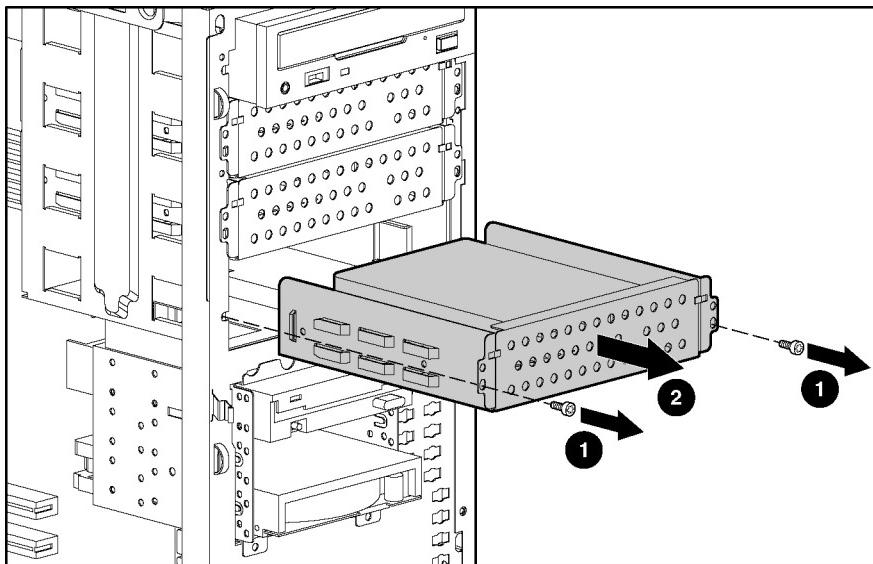


Figure 2-20: Removing the removable media tray from the chassis

6. Remove the screws from the bottom of the device (1).
7. Remove the device from the tray (2).

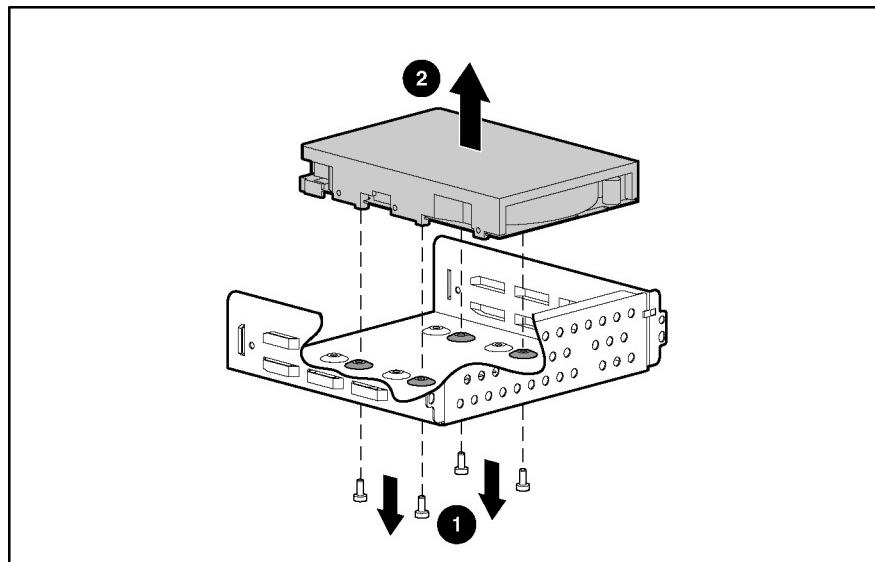


Figure 2-21: Removing a device from the removable media bay

To replace a removable media bay device, reverse steps 2 through 7. Refer to Figure 2-15 to locate the hard drive screws.

Expansion Slots

Figure 2-22 and Table 2-4 identify the expansion slot locations.

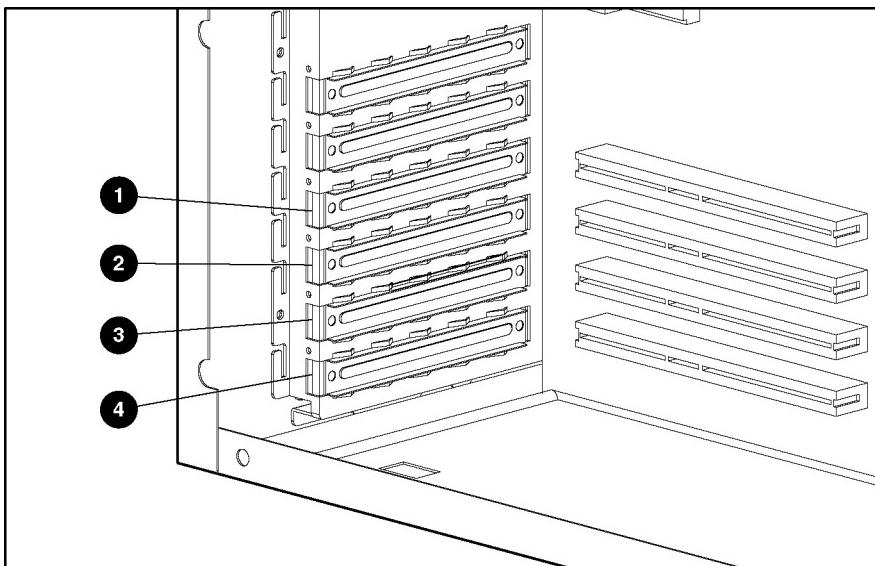


Figure 2-22: Expansion slot locations

Table 2-4: Expansion Slot Locations

Item	Description	Slot Number
1	3.3-volt, 33-MHz, 64-bit PCI slot	1
2	3.3-volt, 33-MHz, 64-bit PCI slot	2
3	3.3-volt, 33-MHz, 64-bit PCI slot	3
4	3.3-volt, 33-MHz, 64-bit PCI slot	4

Removing an Expansion Slot Retainer

To remove an expansion slot retainer:

1. Complete the preparation procedures. Refer to “Preparation Procedures” in this chapter.
2. Remove the access panel. Refer to “Access Panel” in this chapter.
3. Release the expansion board retainer by loosening the screw (1) and pivoting the retainer back towards the front of the chassis (2).

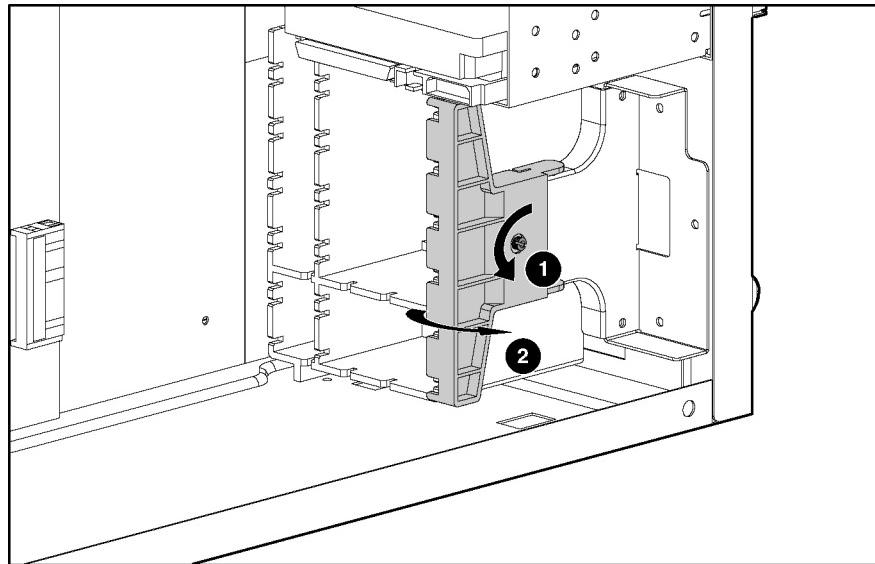


Figure 2-23: Removing an expansion board retainer

To replace an expansion board retainer, reverse steps 2 and 3.

Expansion Board Guide

To remove the expansion board guide:

1. Complete the preparation procedures. Refer to “Preparation Procedures” in this chapter.
2. Remove the access panel. Refer to “Access Panel” in this chapter.
3. Remove all expansion boards supported by the board guide.
4. Push in the four locking tabs (1), and then pull the guide back and away from the chassis (2).

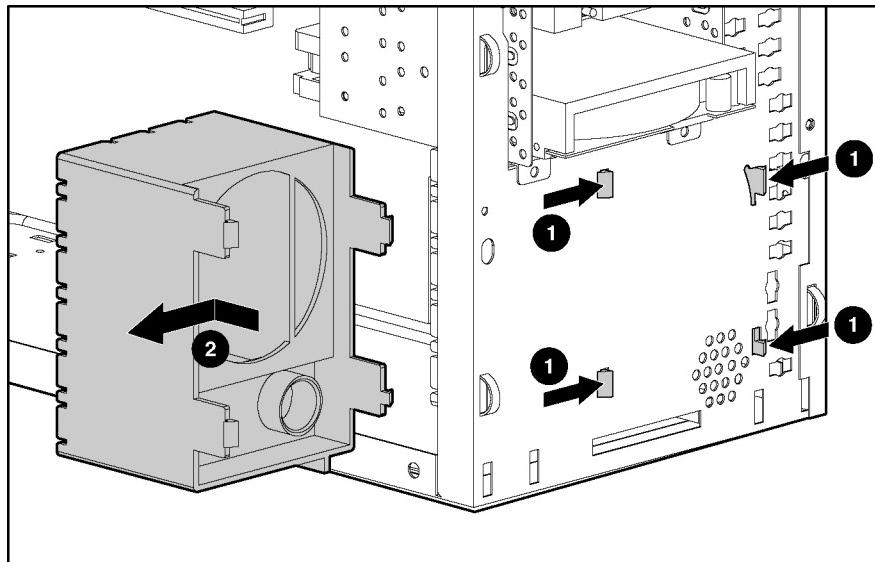


Figure 2-24: Removing the expansion board guide

To replace the expansion board guide, reverse steps 2 through 4.

Memory Modules

The server supports ECC Registered PC2100 DDR SDRAM DIMMs. Additional DIMMs are available to upgrade the memory. The server has four DIMM sockets located on the system board.

NOTE: The server supports PC2100 memory, which runs at full speed with a 533-MHz front side bus CPU, and runs at PC1600 speed with a 400-MHz front side bus CPU.



CAUTION: Electrostatic discharge (ESD) can damage electronic components. Be sure that you are properly grounded (earthed) before beginning any installation procedure. Refer to "Electrostatic Discharge Information" in this chapter for more information.



CAUTION: When handling a memory module, be careful not to touch any of the contacts. Doing so may damage the module.

The following guidelines must be followed when installing or replacing memory:

- Memory modules must be industry-standard, ECC Registered PC2100 DDR SDRAM DIMMs and support CAS Latency 2.5 (CL=2.5).
- Do not mix ECC and non-ECC SDRAM DIMMs. If different types of memory modules are mixed, the server does not properly function.
- The server supports 128-MB, 256-MB, 512-MB, and 1-GB DIMMs.

NOTE: HP recommends that the DIMMs be installed sequentially in slots 1,2,3, and then 4.

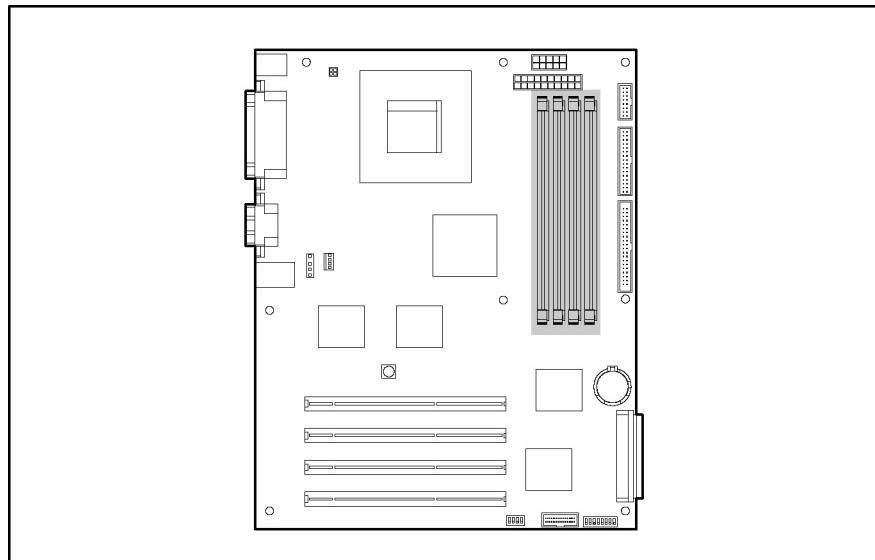


Figure 2-25: Memory module socket locations (SCSI system board)

Removing a Memory Module

To remove a memory module:

1. Complete the preparation procedures. Refer to “Preparation Procedures” in this chapter.
2. Remove the access panel. Refer to “Access Panel” in this chapter.
3. Press outward on both latches of the memory module socket at the same time (1) to release the DIMM and push it partially out of the socket.
4. Lift the memory module from the socket (2).

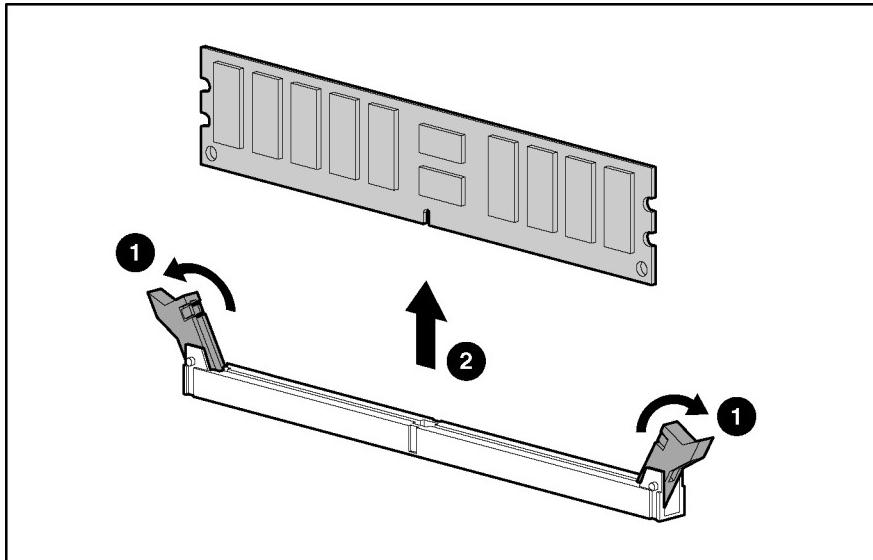


Figure 2-26: Removing a memory module

To replace a memory module, reverse steps 2 through 4.

Processor Socket

The server comes standard with an Intel® Pentium® 4 processor.

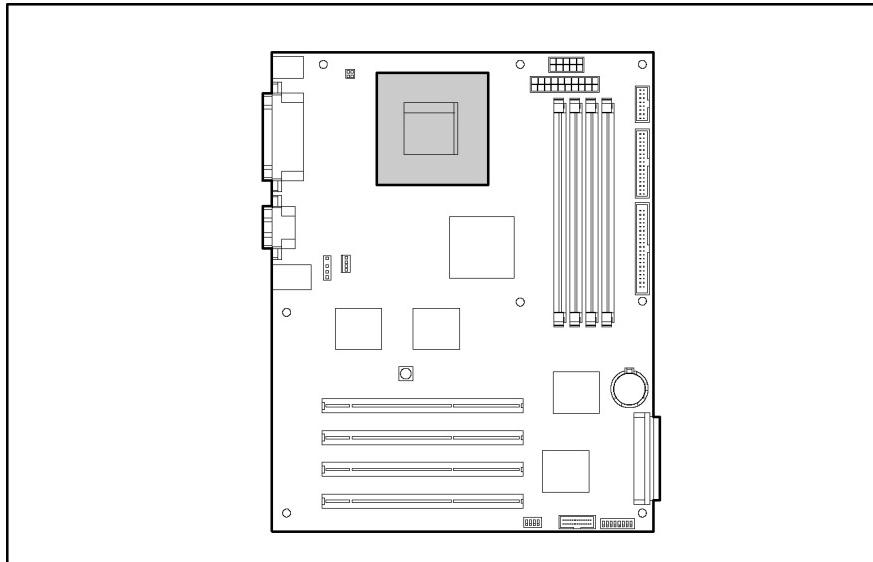


Figure 2-27: Locating the processor socket

Processor and Heatsink with CPU Fan Assembly

To remove the heatsink and processor:



CAUTION: Electrostatic discharge (ESD) can damage electronic components. Be sure that you are properly grounded (earthed) before beginning any installation procedure. Refer to "Electrostatic Discharge Information" in this chapter for more information.



CAUTION: To reduce the risk of personal injury from hot surfaces, allow the internal server components to cool before touching them.

1. Complete the preparation procedures. Refer to "Preparation Procedures" in this chapter.
2. Remove the access panel. Refer to "Access Panel" in this chapter.
3. Lay the server on the right side, so the open side faces up.
4. Unplug the CPU fan from the system board.

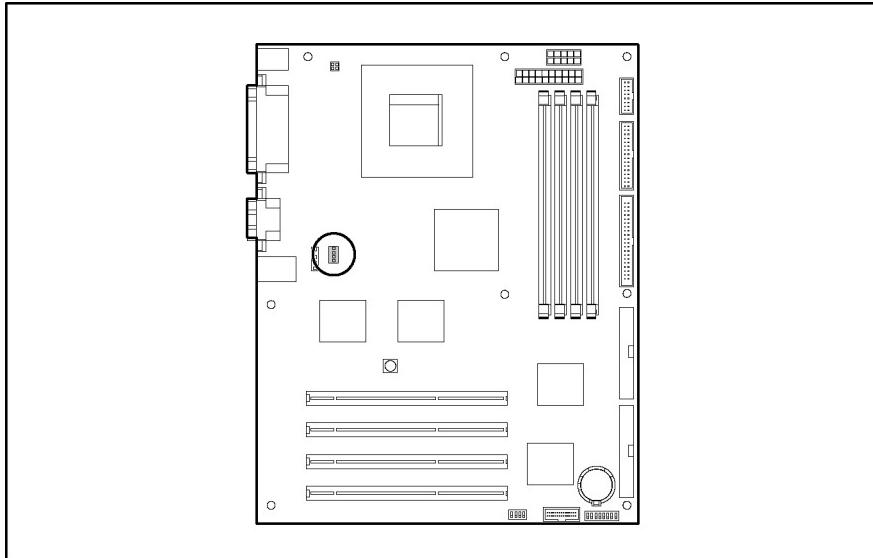


Figure 2-28: CPU fan connector location

5. Push down on the retainer clip levers, and then pull up to remove the levers from the heatsink/CPU fan assembly. Figure 2-29 illustrates one side of the heatsink/CPU fan assembly.

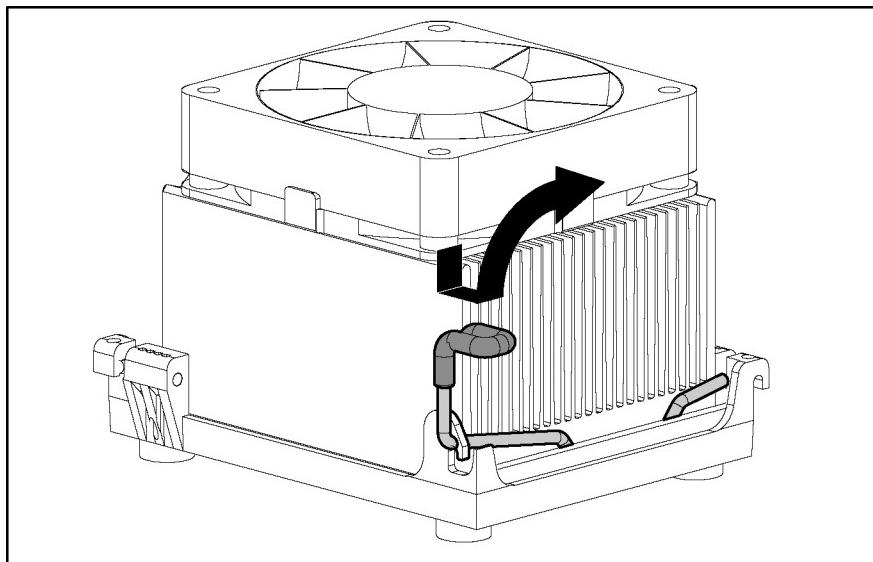


Figure 2-29: Removing the levers from the heatsink/CPU fan assembly

6. Lift the heatsink from the processor.

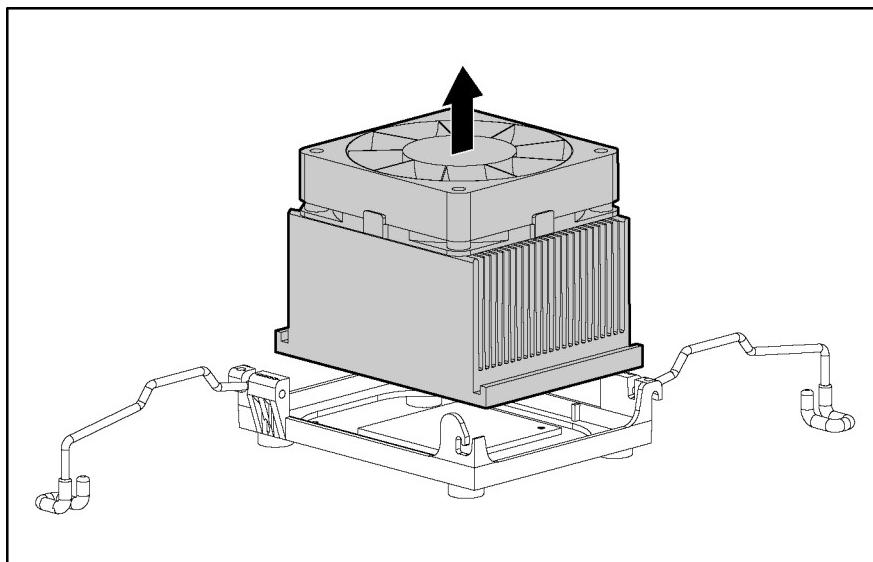


Figure 2-30: Removing the heatsink/CPU fan assembly

7. Raise the processor socket lever (1).

IMPORTANT: The processor socket lever must be perpendicular to the system board to unlock the processor unit.

8. Lift the processor out of the socket (2).

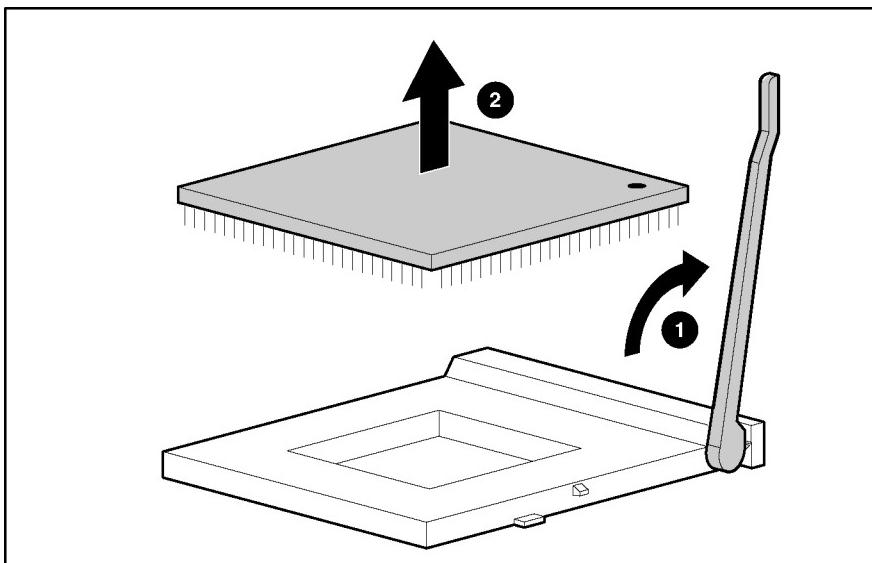


Figure 2-31: Removing the processor

9. Lower the processor socket lever.
10. Reinstall the access panel and the bezel.

To replace the processor, reverse steps 2 through 10.

System Board



CAUTION: Electrostatic discharge (ESD) can damage electronic components. Be sure that you are properly grounded (earthed) before beginning any installation procedure. Refer to "Electrostatic Discharge Information" in this chapter for more information.

To remove the system board:

1. Complete the preparation procedures. Refer to "Preparation Procedures" in this chapter.
2. Remove the access panel. Refer to "Access Panel" in this chapter.
3. Remove all expansion boards seated on the system board.
4. Disconnect all cables from the system board.
5. Remove the seven screws securing the system board to the chassis (1).
6. Slide the system board away from the back of the server, and then pull the system board out of the chassis (2).

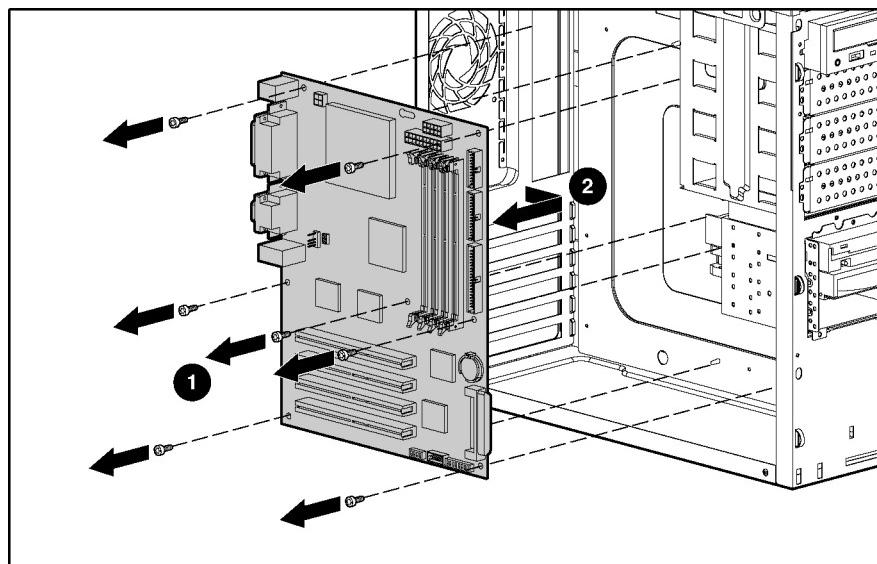


Figure 2-32: Removing the system board

To replace the system board, reverse steps 2 through 6.

Power Supply

To remove the power supply:



WARNING: To reduce the risk of electric shock or damage to the equipment:

- **Unplug the power cord before removing the power supply from the server.**
 - **Install the power supply before connecting the power cord to the power supply.**
-



CAUTION: To avoid dropping the power supply, pull out and hold the power supply with a firm grip.

1. Complete the preparation procedures. Refer to “Preparation Procedures” in this chapter.
2. Remove the access panel. Refer to “Access Panel” in this chapter.
3. Disconnect all power cables from the devices and system board.
4. Remove the four screws securing the power supply to the rear of the chassis (1).
5. Slide the power supply forward, and then lift the power supply from the chassis (2).

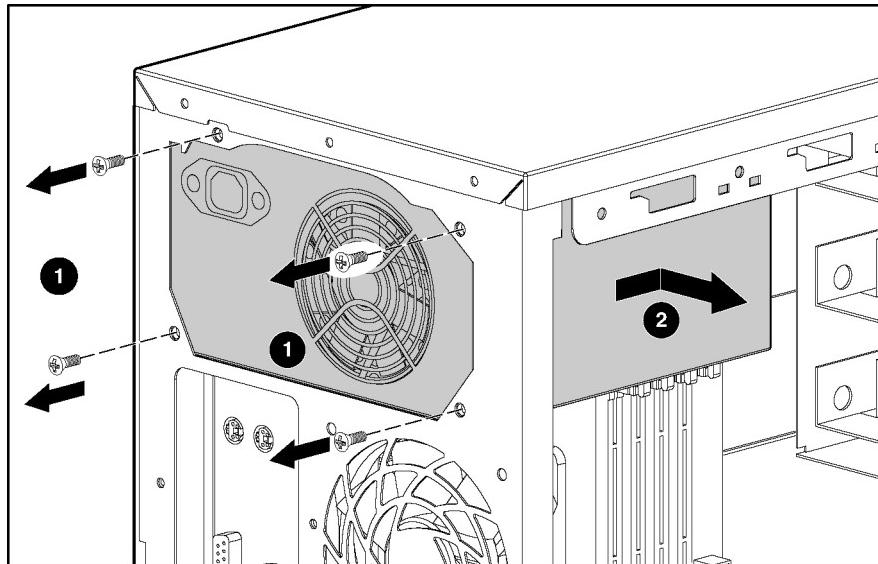


Figure 2-33: Removing the power supply

To replace the power supply, reverse steps 2 through 5.

Battery

The server has nonvolatile memory, which requires a battery to retain server information. The battery is located on the system board.

Replacing the Battery

If the server no longer automatically displays the correct date and time, you may need to replace the battery that provides power to the real-time clock. When replacing the battery, use a 3-volt CR2032 lithium battery.

After you have completed the battery installation, run the ROM-Based Setup Utility (RBSU) by pressing the **F9** key to reconfigure the server. Refer to the *ROM-Based Setup Utility User Guide*.



WARNING: The system board contains a lithium battery. There is a risk of fire and chemical burn if the battery is improperly handled. Do not disassemble, crush, puncture, or short external contacts, dispose of in water or fire, or expose the battery to temperatures higher than 60°C (140°F).



CAUTION: To prevent damage to the equipment or loss of information, be sure that the server is powered down, all cables are disconnected from the back of the server, and the power cord is disconnected from the grounded (earthed) AC outlet before removing the access panel.



CAUTION: Electrostatic discharge (ESD) can damage electronic components. Be sure that you are properly grounded (earthed) before beginning any installation procedure. Refer to "Electrostatic Discharge Information" in this chapter for more information.

To replace the lithium battery on the system board:

1. Complete the preparation procedures. Refer to “Preparation Procedures” in this chapter.
 2. Remove the access panel. Refer to “Access Panel” in this chapter.
 3. Locate the battery on the system board.
- NOTE:** If you have expansion boards installed, it may be necessary to remove them to gain access to the battery.
4. Press outward on the latch at the top of the battery holder to release the battery (1), and then lift the battery away from the holder (2).

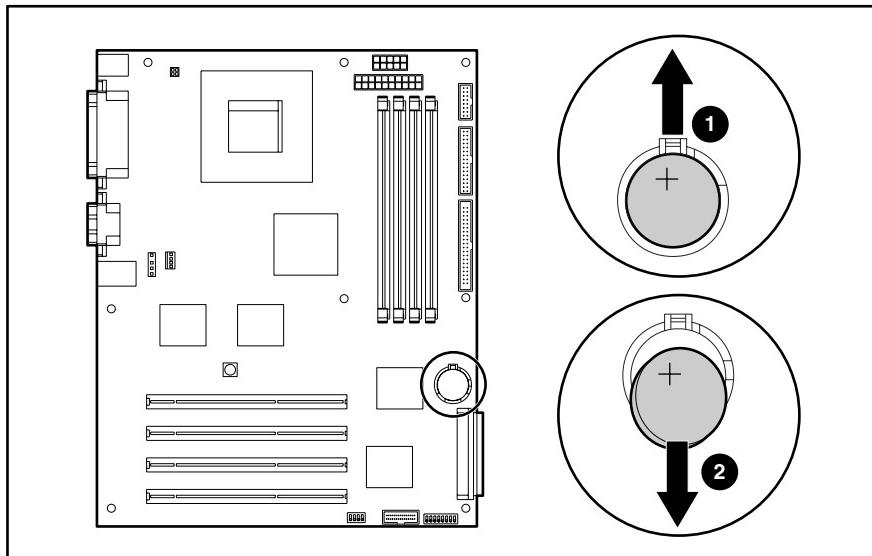


Figure 2-34: Locating and removing the battery from the SCSI system board

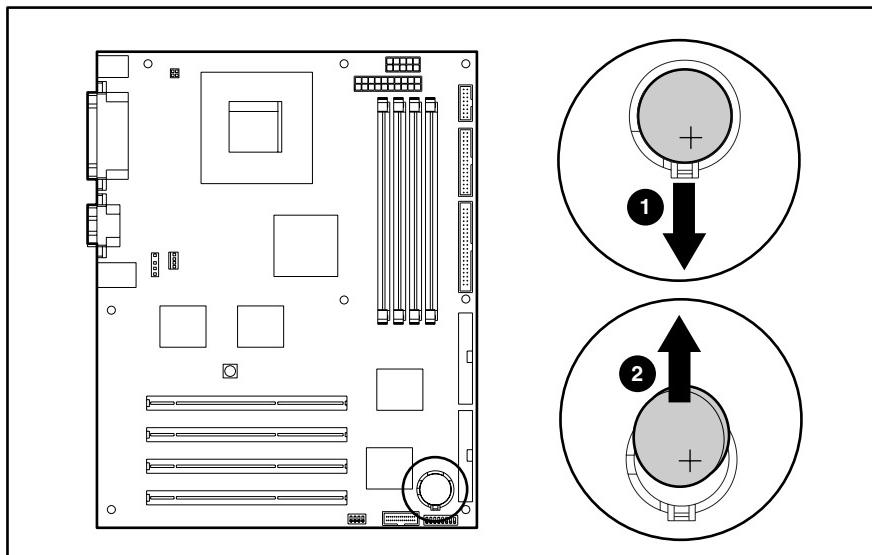


Figure 2-35: Removing the battery from the ATA system board

IMPORTANT: Positive (+) polarity must be positioned up.

5. Slide the replacement battery into the proper position with the positive (+) side up.
6. Replace the server access panel and connect cables to the server.
7. Run RBSU to reconfigure the server by pressing the **F9** key when prompted during server startup. Refer to the *ROM-Based Setup Utility User Guide* for more information on RBSU.

Diagnostic Tools

This chapter provides an overview of the software and firmware diagnostic tools available for the HP ProLiant ML310 server.

Diagnostic Tools Utility Overview

The following utilities were developed to assist in diagnosing problems, testing the hardware, and monitoring and managing the ProLiant ML310 server hardware.

Table 3-1: Diagnostic Tools

Tool	What it is	How to run it
HP Diagnostics Utility	Utility to assist testing and/or verifying operation of HP hardware. If problems are found, HP Diagnostics isolates failures down to the replaceable part whenever possible.	Diagnostics and utilities must be accessed when a system configuration error is detected during Power-On Self-Test (POST). For a complete list of POST error messages, refer to the <i>HP Servers Troubleshooting Guide</i> . HP Diagnostics software is also available on the SmartStart CD. A Diagnostics diskette can be created from the SmartStart CD, and Diagnostics can then be run from the diskette.
Insight Manager application	A client/server application used to remotely manage HP systems in a network environment. Reports hardware fault conditions (both failure and prefailure) and collects data for reporting and graphing.	For more information, refer to the Management CD and the <i>Insight Manager User Guide</i> .
Survey Utility	An online information-gathering program that runs on servers, gathering critical hardware and software information from various sources. A utility for servers running the Microsoft® Windows® 2000, Linux, or Novell NetWare operating system. If a significant change occurs between data-gathering intervals, previous information is marked, and the survey text file is appended to reflect the latest configuration and changes since the last configuration. This utility provides a historical record of change events for server hardware and software.	Survey Utility automatically runs at startup and on specified time intervals. You can modify the data-gathering interval by modifying the command-line parameters. For more information on Survey Utility, including installation and application procedures, refer to the <i>Survey Utility Online Help User Guide</i> accessed through the support link on www.hp.com

continued

Table 3-1: Diagnostic Tools *continued*

Tool	What it is	How to run it
SmartStart software	Located on the SmartStart CD, SmartStart is the intelligent way to set up the HP server. The SmartStart CD is used to load the system software, thereby achieving a well-integrated server and ensuring maximum dependability and supportability. The SmartStart CD contains diagnostic utilities and ROMPaq tools.	Power up from the SmartStart CD.
SmartStart Diskette Builder	Creates a diskette version of the utility from the SmartStart CD.	Use a workstation running the Microsoft Windows 95, Windows 98, Windows NT®, or Windows 2000 operating system. You also need several 1.44-MB diskettes. Insert the SmartStart CD into the workstation drive. The CD automatically runs the Diskette Builder Utility; however, if the server does not support the auto-run feature, use Windows Explorer to run <i>CD-ROM drive</i> \DSKBLDR\DSKBLDR.EXE.
ROMPaq Utility	Utility that upgrades the current system ROM.	Insert a ROMPaq diskette into the diskette drive, remove power from the server, and then power up the server again.
System Firmware Update	Utility that updates system firmware on remote servers from a central location (used in conjunction with the Remote Deployment Utility Console)	Latest maintenance ROM executable file can be downloaded from www.hp.com/support/files/server/us/download/9861.html
ROM-Based Setup Utility (RBSU)	Utility used to configure some hardware installed in or connected to the server. Specifically, it can: <ul style="list-style-type: none"> • Resolve resource conflicts in areas such as memory, port addresses, and interrupts (IRQs). • Configure PCI boards automatically. • Manage installation of memory, processor upgrades, and mass storage devices such as hard drives, tape drives, and diskette drives. • Store configuration information in nonvolatile memory. • Configure the platform for an operating system. 	Run RBSU directly from the system ROM by pressing the F9 key when prompted during POST to enter the utility.

continued

Table 3-1: Diagnostic Tools *continued*

Tool	What it is	How to run it
Automatic Server Recovery (ASR)	<p>A tool that lets the server restart automatically after a catastrophic operating system failure, including software errors, OS lockups, environmental abnormalities, and some hardware errors.</p> <p>A system failsafe timer, the ASR timer, is started when the HP System Management driver, also known as the health driver, is loaded. The Insight Manager console notifies you in the event of an ASR restart. You can disable ASR from the Insight Manager console.</p>	This tool is a function of the hardware/software system through RBSU. Be sure that this tool is enabled through RBSU. The systems management drive must be loaded to activate ASR.
Integrated ATA RAID Configuration Utility (ATA models only)	<p>Supports and configures RAID arrays. The features include:</p> <ul style="list-style-type: none"> • Optimized drive access • RAID support before operating system loads • Automatic detection and configuration • Ability to handle configuration changes • Support for PIO modes 0-4, MDMA modes 0-2, and Ultra DMA modes 0-5 (0-5 for ATA/100) • Support for RAID levels 0, 1, and 1+0 • Multiple drive rebuilding • Special handling of error log, spare drive, and rebuilding 	<p>After all hard drives have been installed and connected, press the F8 key during startup to run the Integrated ATA RAID Configuration Utility and view the setup screen. ROM will automatically configure drives to RAID 0 if you do not run the F8 utility.</p> <p>To turn off the Integrated ATA RAID Management:</p> <ul style="list-style-type: none"> • In Microsoft operating systems, right-click on the tray icon and select Quit Spy. • In Novell operating systems, enter Unload Spy at the console. • In Linux operating systems, enter Spy-Stop at the prompt. <p>Turning off this utility turns off the ability for online spares to be rebuilt in the event there is a drive failure. You need to power up the server and rebuild the spare in the RAID Configuration Utility by pressing the F8 key.</p> <p>To turn on the Integrated ATA RAID Configuration Utility:</p> <ul style="list-style-type: none"> • In Microsoft operating systems, power up the server or log off the server and then log back on. • In Novell operating systems, enter Load Spy at the console. • In Linux operating systems, enter Spy-Start at the prompt.
Power-On Self-Test (POST)	The POST is a series of diagnostic tests that checks firmware and assemblies to ensure that the server is properly functioning.	POST runs automatically on HP servers when the server is powered up.

For More Information

For detailed information about each of these diagnostic tools, refer to the *HP Servers Troubleshooting Guide* on the Documentation CD. For the most recent version of this guide, refer to the Reference Library on the HP ProLiant ML310 page at

www.hp.com

Connectors, Switches, and LEDs

This chapter contains illustrations and tables identifying connectors, switches, and LED locations on the system board and rear panel for the HP ProLiant ML310 server.

Connectors

This section contains graphics and tables identifying connector and component locations on the system board and rear panel of the server.

System Board Components

Figure 4-1 and Table 4-1 identify the SCSI system board components for the server.

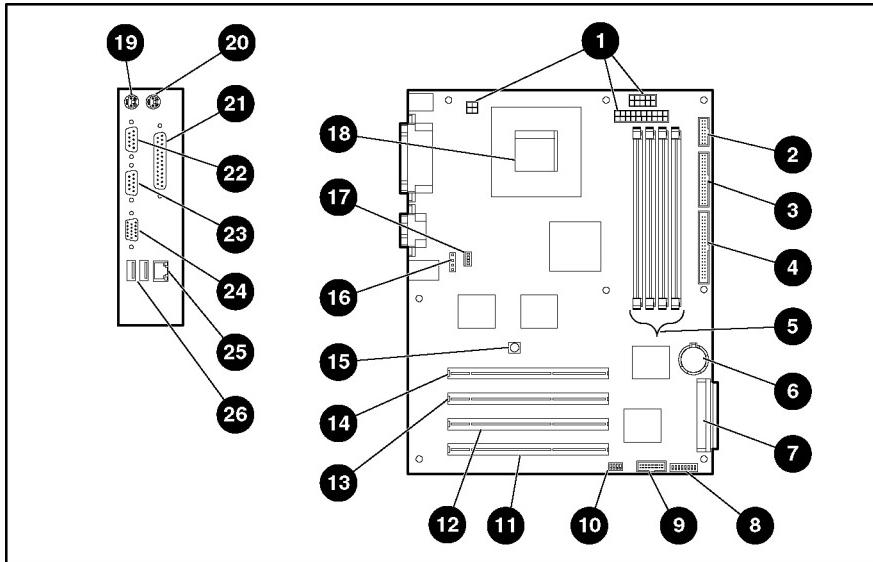


Figure 4-1: SCSI system board components

Table 4-1: SCSI System Board Components

Item	Component	Item	Component
1	Power supply connectors	14	64-bit PCI expansion slot 1
2	Power switch assembly connector	15	NMI switch
3	Diskette drive connector	16	System fan connector
4	IDE connector (ATAPI devices)	17	CPU fan connector
5	DIMM slots	18	Processor socket
6	CR2032 battery	19	Keyboard connector
7	SCSI connector	20	Mouse connector
8	System configuration switch	21	Parallel port
9	RIB 30-pin header	22	Serial port connector B
10	System ID switch	23	Serial port connector A
11	64-bit PCI expansion slot 4	24	Video connector
12	64-bit PCI expansion slot 3	25	RJ-45 Ethernet connector
13	64-bit PCI expansion slot 2	26	USB port connectors

Note: For information on system board LEDs and system configuration switch settings, refer to “Appendix E” in the *HP ProLiant ML310 Server Setup and Installation Guide*.

ATA System Board

Figure 4-2 and Table 4-2 identify the ATA system board components for the server.

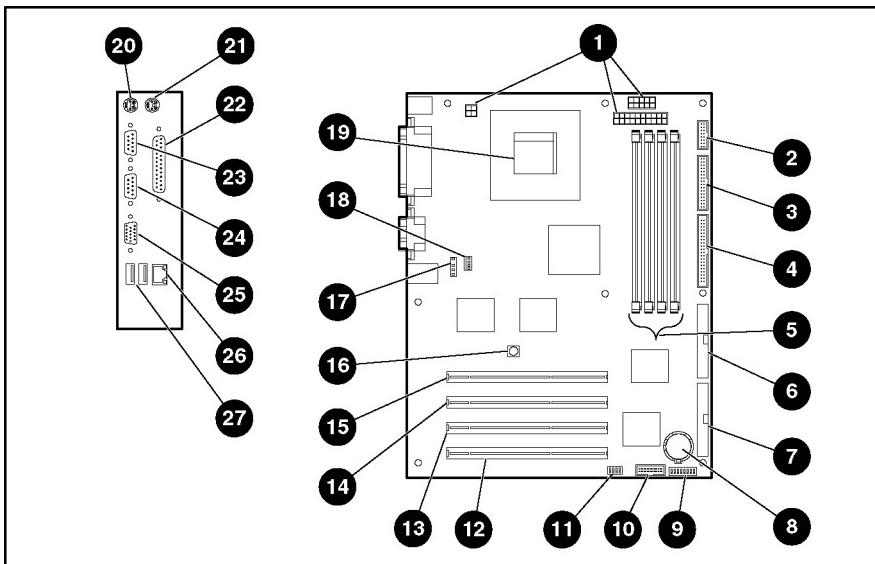


Figure 4-2: ATA system board components

Table 4-2: ATA System Board Components

Item	Component	Item	Component
1	Power supply connectors	15	64-bit PCI expansion slot 1
2	Power switch assembly connector	16	NMI switch
3	Diskette drive connector	17	System fan connector
4	IDE connector (ATAPI devices)	18	CPU fan connector
5	DIMM slots	19	Processor socket
6	ATA/100 RAID primary connector	20	Keyboard connector
7	ATA/100 RAID secondary connector	21	Mouse connector
8	CR2032 battery *	22	Parallel port
9	System configuration switch	23	Serial port connector B
10	RIB 30-pin header	24	Serial port connector A
11	System ID switch	25	Video connector
12	64-bit PCI expansion slot 4	26	RJ-45 Ethernet connector
13	64-bit PCI expansion slot 3	27	USB port connectors
14	64-bit PCI expansion slot 2		

Note: For information on system board LEDs and system configuration switch settings, refer to “Appendix E” in the *HP ProLiant ML310 Server Setup and Installation Guide*.

* For information on how to replace the battery, refer to “Replacing the Battery” in Chapter 2.

Rear Panel Connectors

Figure 4-3 and Table 4-3 identify the rear panel connectors for the server.

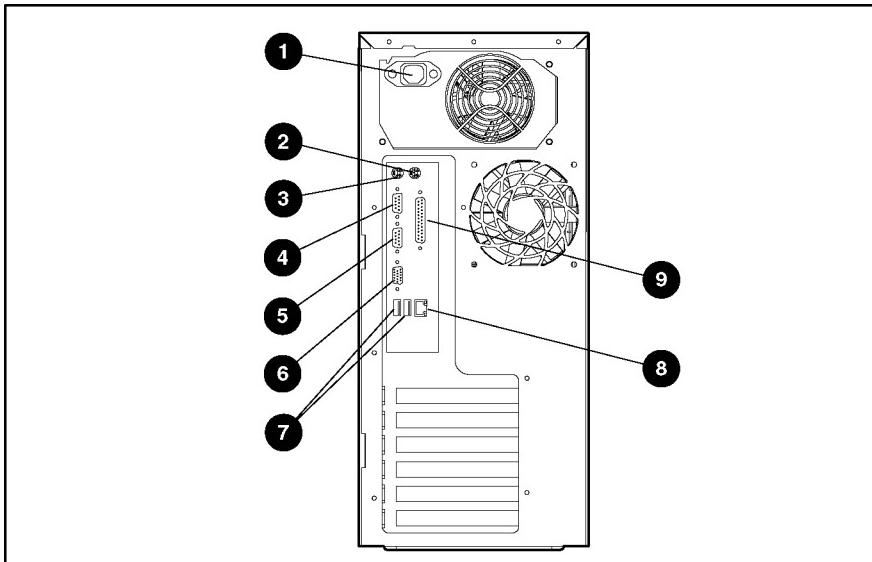


Figure 4-3: Rear panel connectors

Table 4-3: Rear Panel Connectors

Item	Description	Item	Description
1	Power cord connector	6	Video connector
2	Mouse connector	7	USB ports
3	Keyboard connector	8	RJ-45 Ethernet connector
4	Serial port connector B	9	Parallel port
5	Serial port connector A		

Internal SCSI Components

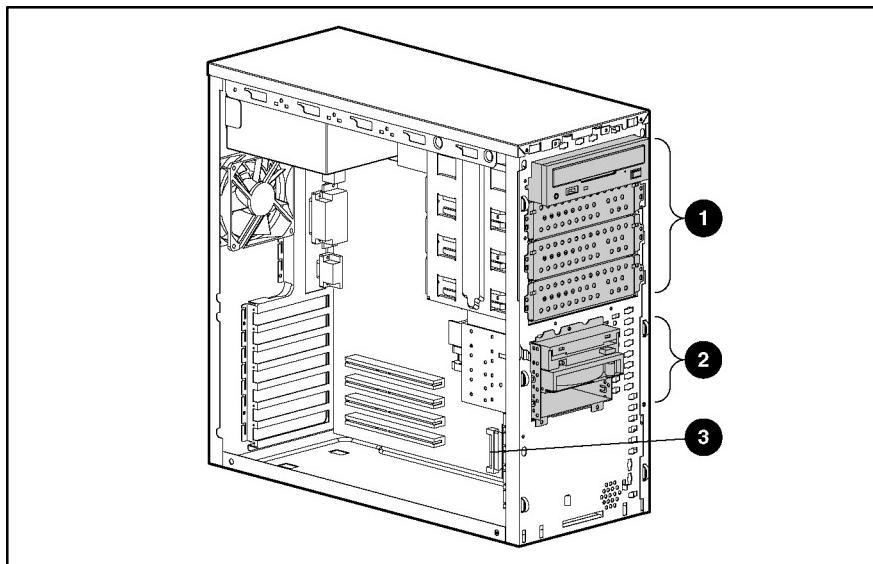


Figure 4-4: Internal SCSI components

Table 4-4: Internal SCSI Components

Item	Description
1	Removable media bay area
2	Hard drive bay area
3	Internal SCSI connector A

Internal ATA Components

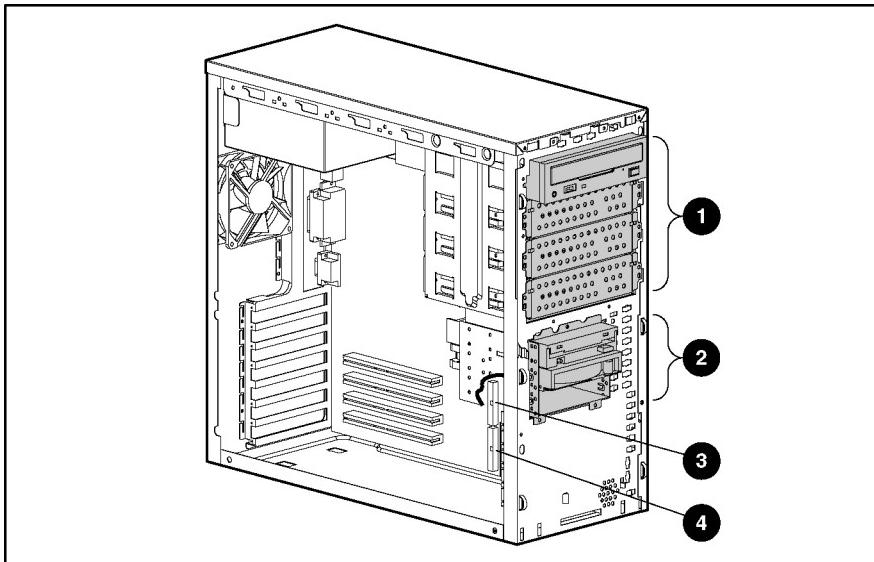


Figure 4-5: Internal ATA components

Table 4-5: Internal ATA Components

Item	Description
1	Removable media bay area
2	Hard drive bay area
3	ATA/100 primary controller
4	ATA/100 secondary controller

Switches

The server contains two switchbanks. This section explains the use of each reserved and nonreserved switch.

System Configuration Switch

Figure 4-6 and Table 4-6 identify the system configuration switch default settings for the server.

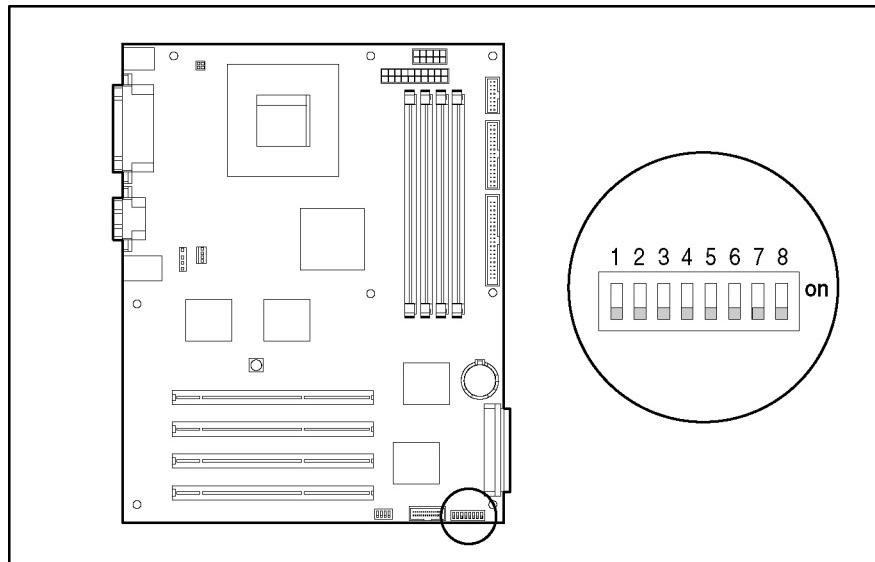


Figure 4-6: System configuration switch default settings

Table 4-6: System Configuration Switch Default Settings

Position	Default	Description	Settings
1	Off	Reserved	N/A
2	Off	Lock configuration	Off = Normal operation On = Configuration changes cannot be made
3	Off	Tower/rack configuration	Off = Tower configuration On = Rack configuration
4	Off	Diskette boot	Off = Observe RBSU diskette boot selection On = Override RBSU setting and allow diskette boot selection
5	Off	Password disable	Off = Enable password prompts On = Disable password prompts
6	Off	Clear CMOS and NVRAM	Off = Normal On = When the server is powered up, all system configuration information is erased
7	Off	Reserved	N/A
8	Off	Reserved	N/A

Note: Switch positions 7 and 8 are reserved for HP authorized service providers only. Do not change the specified default setting for these positions, unless instructed otherwise.

System ID Switch Settings

Figure 4-7 and Table 4-7 identify the system ID switch settings for the server.

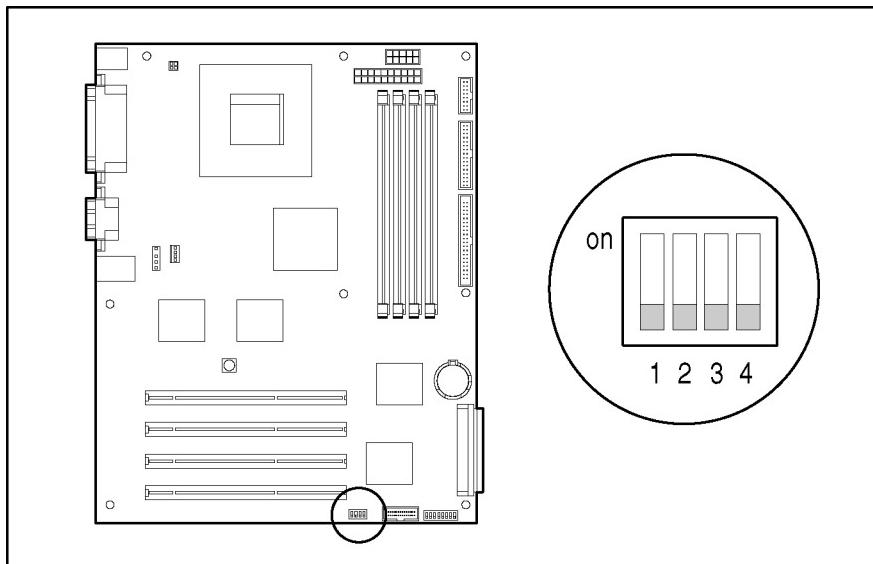


Figure 4-7: System ID switch default settings

Table 4-7: System ID Switch Default Settings

Item	Default	Function
1	Off	Reserved
2	Off	Reserved
3	Off	Reserved
4	Off	Reserved

LEDs

This section contains graphics information on the following LEDs:

- Server LEDs (on the front of the server)
- System board LEDs
- Network controller LEDs (on the back of the server)

Server LEDs

Figure 4-8 and Table 4-9 identify the LED locations on the front of the server.

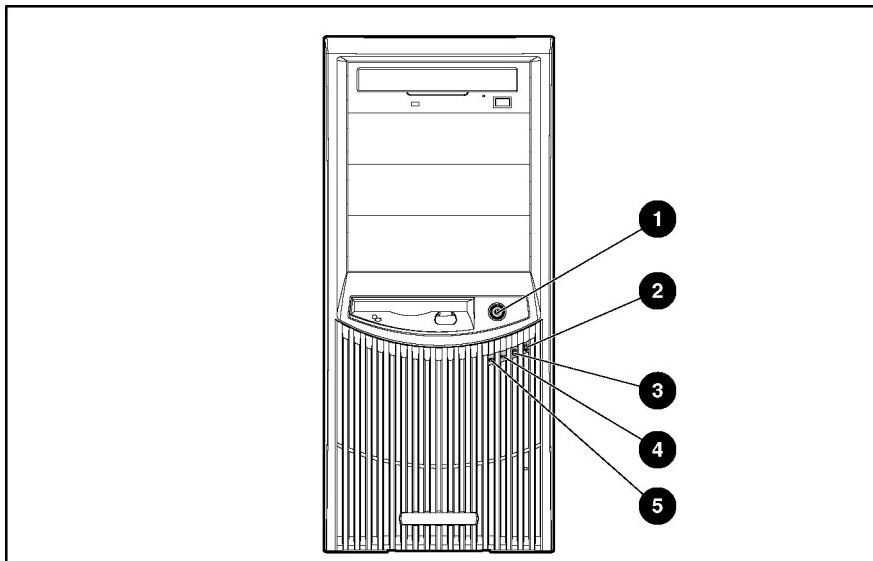


Figure 4-8: Server LEDs

Table 4-8: Server LEDs

Item	Description	Status
1	Power button	N/A
2	Power On/Standby LED	Green = Server on, AC power OK. Do not remove power from server. Flashing green = Server sleeping. Do not remove power from the server. Amber = Server in standby mode. AC power OK. Off = Server off, no AC power.
3	Hard drive LED	On or flashing = A hard drive is being accessed. Off = No hard drive is currently being accessed.
4	NIC Link/Activity	Flashing = Network activity detected. Green = Linked to network.
5	Internal health LED	Green = Server on, health good. Amber = Server health degraded. Red = Server health critical.

System Board LEDs

Figure 4-9 and Table 4-9 identify the system board LEDs for the server.

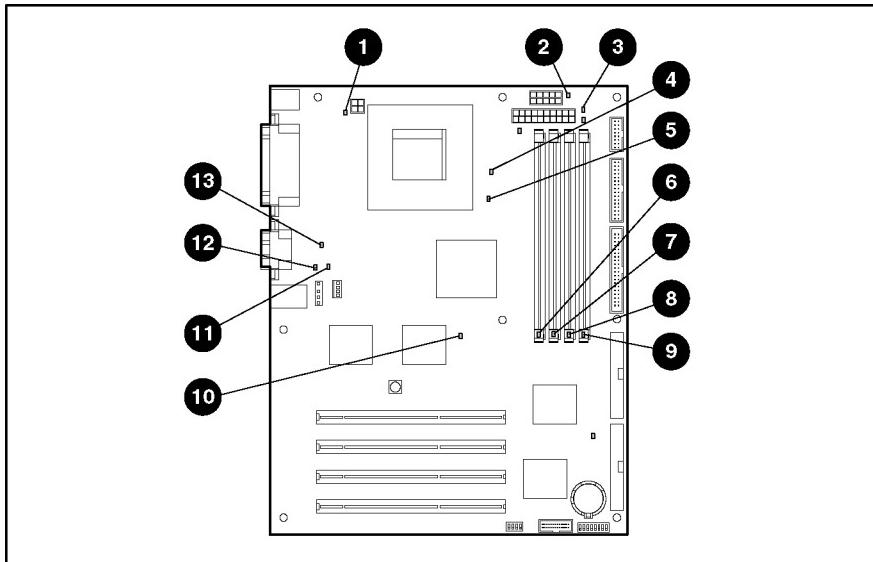


Figure 4-9: System board LEDs

Table 4-9: System Board LEDs

Item	Description	Status
1	4-pin power connector	Off = Processor installed. Amber = Processor not installed.
2	Second 4-pin power connector	Off = Power connector installed. Amber = Power connector not installed.
3	AC power	Off = The AC power cord is not plugged into the power supply or the power supply failed. Green = Power supply is on and functioning.
4	CPU 1 pre-failure or failure	Off = CPU functioning. Amber = CPU failed or is missing.
5	Processor thermal	Off = Processor temperature normal. Amber = Thermal trip for processor 1 detected. Refer to POST error messages for appropriate instructions.
6	DIMM 4 failure	Off = DIMM 4 functioning. Amber = DIMM 4 failed.
7	DIMM 3 failure	Off = DIMM 3 functioning. Amber = DIMM 3 failed.
8	DIMM 2 failure	Off = DIMM 2 functioning. Amber = DIMM 2 failed.
9	DIMM 1 failure	Off = DIMM 1 functioning. Amber = DIMM 1 failed.
10	System thermal failure	Off = Temperature is normal. Amber = Temperature threshold exceeded.
11	CPU fan failure	Off = Fan is functioning. Amber = Fan is not installed or has failed.
12	System fan failure	Off = Fan is functioning. Amber = Fan is not installed or has failed.
13	Integrated processor power module (PPM) failure	Off = PPM is functioning. Amber = PPM has failed.

Network Controller LEDs

Figure 4-10 and Table 4-10 identify the network controller LEDs for the server.

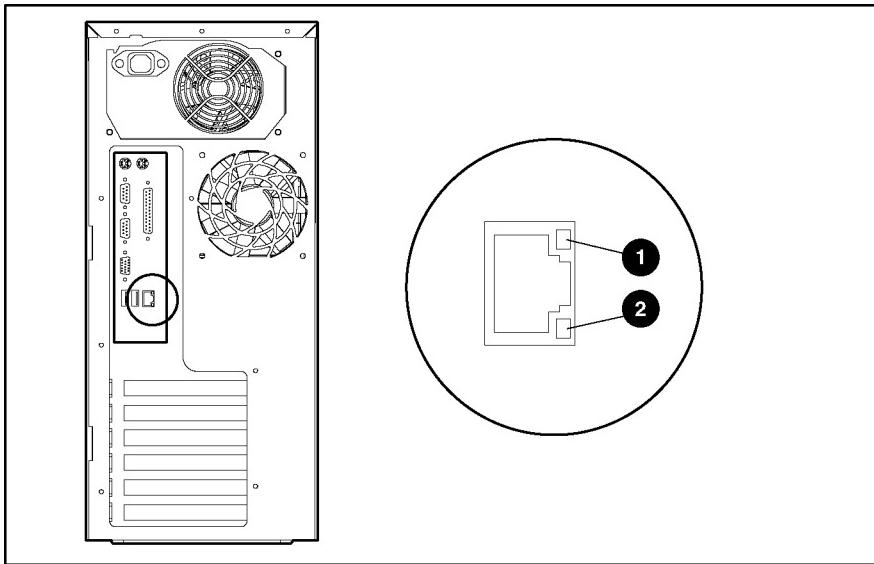


Figure 4-10: Network controller LEDs

Table 4-10: Network Controller LEDs

Item	Description	Status
1	Network activity LED	Off = No network activity On = Network activity
2	Network link LED	Off = No network link On or flashing = Linked to network

Physical and Operating Specifications

This chapter provides specifications for the HP ProLiant ML310 server. The following specifications are provided:

- Server unit
- Memory
- 3.5-inch diskette drive
- IDE CD-ROM drive
- ATA hard drives
- Wide Ultra3 SCSI hard drives
- HP NC7760 Gigabit Server network interface controller (NIC)
- Integrated dual-channel Wide Ultra3 SCSI controller
- Integrated dual-channel ATA/100 RAID controller

Server Unit

Table 5-1: Server Unit Specifications

Specification	Value
Dimensions	
Height	42.0 cm (16.5 in)
Width	19.1 cm (7.5 in)
Depth	48.5 cm (19.1 in)
Approximate weight	18.18 kg (40 lb) weight approximate, depending upon options
International input requirements (per power supply)	
Rated input voltage	200 VAC to 240 VAC
Rated input frequency	50 Hz to 60 Hz
Rated input current	<8 A RMS at 90 VAC with maximum load
U.S. input requirements	
Rated input voltage	100 VAC to 127 VAC
Rated input frequency	50 Hz to 60 Hz
Rated input current	6 A RMS at 90 VAC with maximum load
Power supply output power	
Rated steady state power	300 W
Maximum peak power	400 W
Btus for tower model	1,560 Btu/hr
Temperature range*	
Operating	10°C to 35°C (50°F to 95°F)
Nonoperating	-40°C to 70°C (-40°F to 158°F)
Relative humidity (noncondensing)	
Operating	10% to 90%
Nonoperating	5% to 95%
Acoustic noise	
Idle (hard drives spinning)	5.5 NPEL (Bels)/45 AVERAGE SPL (dba)
Operating (random seeks to hard drives)	6.0 NPEL (Bels)/45 AVERAGE SPL (dba)

* All temperature ratings are shown for sea level. There is an altitude derating of 1°C per 300 m to 3,000 m (1.8°F per 1,000 ft to 10,000 ft).

Memory

Table 5-2: Memory Specifications

Specification	Value
Size	64 MB, 128 MB, 256 MB, and 512 MB, and 1 GB
Speed	DDR 200/266 MHz
Type	ECC Registered PC2100 DDR SDRAM DIMMs

Diskette Drive

Table 5-3: 1.44-MB Diskette Drive Specifications

Specification	Value
Size	8.89 mm (3.5 in)
LEDs (front panel)	Green
Read/write capacity per diskette (high/low density)	1.44 MB/720 KB
Drives supported	1
Drive height	Third, 1 inch
Drive rotation	300 rpm
Transfer rate bits/sec (high/low)	500 Kbps/250 Kbps
Bytes/sector	512
Sectors per track (high/low)	18/9
Tracks per side (high/low)	80/80
Access times	
Track-to-track (high/low)	3 ms/6 ms
Average (high/low)	169 ms/94 ms
Settling time	15 ms
Latency average	100 ms
Cylinders (high/low)	80/80
Read/write heads	2

IDE CD-ROM Drive

Table 5-4: IDE CD-ROM Specifications

Specification	Value
Applicable disk	CD-ROM (modes 1 and 2); mixed mode (audio and data combined); CD-DA; Photo CD (single- and multiple-session), CD-XA (mode 2, forms 1 and 2); CDI ready; CD-WO
Capacity	650 MB
Rotational speed	5,200 rpm
Block size	2,328 bytes (CD-XA) 2,340 bytes, 2,336 bytes, 1,024 bytes (mode 2) 2,048 bytes, 1,024 bytes (mode 1) 2,352 bytes (CD-DA)
Dimensions	
Height	42.9 mm (1.69 in)
Width	208.0 mm (8.2 in)
Depth	150.1 mm (5.91 in)
Weight	0.950 kg (2.09 lb)
Data transfer rate	
Sustained	150 KBps (single), 1,500 to 4,800 KBps (10X to 32X)
Burst	150 KBps to 4,800 KBps
Interface	IDE (ATAPI)
Access times (typical)	
Full stroke	<150 ms
Random	<100 ms
Diameter	12 cm, 8 cm (4.7 in, 3.15 in)
Center hole	15 mm (0.6 in)
Thickness	1.2 mm (0.05 in)
Track pitch	1.6 μ m
Cache/buffer	128 KB
Startup time	<7 seconds
Stop time	<4 seconds
Laser parameters	
Type	Semiconductor Laser GaAlAs
Wave length	780 \pm 25 nm
Divergence angle	53.5° \pm 1.5°

continued

Table 5-4: IDE CD-ROM Specifications *continued*

Specification	Value
Output power	0.14 mW
Operating conditions	
Temperature	5°C to 45°C (41°F to 113°F)
Humidity	5% to 90% (10% to 80%)

ATA Hard Drives

Table 5-5: ATA Hard Drive Specifications

Description	80 GB 7.2K rpm	40 GB 7.2K rpm
Capacity	80,020.0 MB	40,020.0 MB
Height	26.1 mm (1.028 in)	26.1 mm (1.028 in)
Width	101.6 mm (4 in)	101.6 mm (4 in)
Interface	Ultra ATA/100	Ultra ATA/100
Transfer rate synchronous (max)	100 MBps	100 MBps
Seek time (typical, including setting)		
Single track	1.2 ms	1.2 ms
Average	<8.55 ms	<8.55 ms
Full stroke	<20.0 ms	<20.0 ms
Rotational speed	7,200 rpm	7,200 rpm
Physical configuration		
Logical blocks	156,301,488	78,165,360
Bytes/sector	512	512
Operating temperature		
Celsius	5° to 55°	5° to 55°
Fahrenheit	41° to 131°	41° to 131°

Wide Ultra3 SCSI Hard Drives

Table 5-6: Wide Ultra3 SCSI Hard Drive Specifications

Description	18.2 GB 10 K rpm	36.4 GB 10 K rpm
Capacity	18,209.3 MB	36,419.2 MB
Height	25.4 mm (1 in)	25.4 mm (1 in)
Width	101.6 mm (4.0 in)	101.6 mm (4.0 in)
Interface	Wide Ultra3 SCSI	Wide Ultra3 SCSI
Transfer rate synchronous (max)	160 MBps	160 MBps
Seek time (typical, including setting)		
Single track	0.7 ms	0.7 ms
Average	5.4 ms	5.4 ms
Full stroke	11.0 ms	11.0 ms
Rotational speed	10,000 rpm	10,000 rpm
Physical configuration		
Bytes/sector	512	512
Logical blocks	35,565,080	71,132,000
Operating temperature		
Celsius	10° to 35°	10° to 35°
Fahrenheit	50° to 95°	50° to 95°

Integrated 10/100/1000 Wake on LAN Network Interface Controller

Table 5-7: Integrated 10/100 Wake on LAN NIC Specifications

Specification	Value
Network interface	1000Base-T/100Base-TX/10Base-T
Compatibility	IEEE 802.3am, 802.3u, 802.3
Data transfer method	32-bit, 33-MHz PCI bus master
Network transfer rate	10/100/1000 MBps
Connector	RJ-45
Compliance	PCI 2.2
OS support	For specific OS support, refer to www.hp.com/products/servers/platforms
Management support	Wake on LAN (WOL), Pre-Boot Execution Environment (PXE)

Integrated Single-Channel Wide Ultra3 SCSI Controller

Table 5-8: Integrated Single-Channel Wide Ultra3 SCSI Controller Specifications

Specification	Value
SCSI Protocol	Wide Ultra3 SCSI, Wide Ultra2 SCSI, Wide Ultra SCSI-3, Fast-Wide SCSI-2, and Fast SCSI-2
Electrical Protocol	Low Voltage Differential (LVD)
Drives supported	Up to 14 SCSI devices per channel
Data transfer method	64-bit/33-MHz PCI bus master
Maximum host bus transfer rate	267 MBps per channel
Maximum SCSI transfer rate	160 MBps per channel
Storage Capacity	Up to 1019.2 GB

Integrated Dual-Channel Ultra ATA 100 Controller

Table 5-9: Integrated Dual-Channel Ultra ATA 100 Controller Specifications

Specification	Value
Protocol	UDMA Mode (0-5) PIO Mode (0-4)
Drives supported	Up to 4 ATA (2 devices per channel)
Data transfer method	32-bit/33-MHz PCI bus-master
Maximum transfer rate per PCI Bus (peak)	133 MBps per channel
ATA 100 Cable	80-conductor cable
ATA channel transfer rate	100 MBps per channel
ATA connectors	Two 40-pin connectors (primary and secondary)

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